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International Electrical Relations.

ONE of the principal financial daily newspapers published in London has rendered a service recently by publishing a series of articles on German Economic Conditions based upon material collected by its Managing Editor during a visit to Germany.

The sixth article of the series possesses a direct electrical interest because it advances the views expressed by Herr Kommerzienrat Paul Mamroth, a director of the Allgemeine Elektrizitäts Gesellschaft, on the question of foreign co-operation in the provision of capital for assisting economic recovery in Germany. This, it will be remembered, is not a new subject so far as the columns of the ELECTRICAL REVIEW are concerned, for we have already given somewhat full information showing to what a large extent American capital has been found during the past eighteen months for development work in connection with German electrical undertakings and manufacturing concerns.

Before referring to the statements credited to Herr Mamroth, however, we may make parenthetical allusion to a singular error into which Mr. R. J. Barrett, the interviewer, has fallen. As the accredited representative of a leading financial newspaper, who we should presume to be somewhat closely in touch with the electrical security market in London, one would hardly have expected him to be under the impression that the Allgemeine Elektrizitäts Gesellschaft was "better known in England as the General Electric Company." If he were moving immediately in British electrical circles he would know that the German company is better known here by the initial letters "A.E.G." than by the name quoted. Indeed, he would not have to inquire far in order to discover that there are in this country and in the States two very large concerns each of which has the right to be known as the General Electric Company. The letters "G.E.C." have been a household word here and throughout the British Empire for many years as relating to the General Electric Company, Limited, of London, Witton, and elsewhere. Some confusion occasionally arises here by reason of the fact that the letters "G.E." or "G.E.C." are an equally well-known household description for manufactures emanating from Schenectady. Perhaps when the new Monomark idea comes into use the postal authorities may overcome the difficulty of

deciding whether communications received in London are intended for Kingsway or for Aldwych, but we can hardly conceive of their passing on to the A.E.G. in London communications addressed to either the General Electric Company, Limited, or to the General Electric Company either with or without the use of Monomarks. It may be a pity that the names of competing concerns should be so similar, but at this late date we have to accept such things as they are and leave it to the reader to see that he understands the real differences.

The article in our financial contemporary does not become less interesting because of this error, for Mr. Barrett does not proceed to express his personal opinions regarding the general subject of foreign capital for German electrical industry; he is content to pass on the views of Herr Mamroth, to which we now turn.

It seems that there is no investing public in Germany to-day; the rank and file have not yet begun to accumulate money; foreign investors show no inclination to buy German industrial shares; therefore German shares "are to-day quoted at prices far below their true value." As soon as investment money accumulates in Germany, the public will begin to buy, the prices of the shares will rise, and British investors, if they come in now, will benefit by the rise. Simultaneously they will benefit Germany by providing the country with working capital.

Not less interesting than this is the statement that "short-term" loans are of no use to German industry, which for modernising plant needs "long-term" loans, repayable when the new machinery is running and paying dividends. Yet from almost every export market we are continually hearing that German traders are able to grant "long-term" credits to clients and so defeat the foreign competitors, including the British. Industry seems to obtain the funds from German banks or somewhere else to enable it to grant long-term credits, and it simultaneously invokes the aid of British investors to enable it to develop, modernise, and render more efficient competitively the organisations which already grant these favourable facilities to overseas customers.

Herr Mamroth obviously sees difficulties in convincing the hard-headed British investor, for he hazards a second possibility which is that foreign industry should buy works and plant in Germany and thus participate in production. Let it not be forgotten that he is speaking as a director of the A.E.G. What does he mean by the expression "foreign industry?" As we have said already in these pages, nobody can foretell what may be the developments that the future has in store in respect of international electrical relations, either financial or trading, but can it be that Herr Mamroth has thought of such a possibility as British electrical companies buying up the works and plant of the A.E.G. in Germany? Perhaps we have named the extremest possible case that occurs to us; of course Herr Mamroth and his friends will hardly be unmindful of the likelihood that there might be a less pronounced antipathy to German manufactures if ever such a thing, or any development approaching it, occurred.

The matter stretches far beyond the borders of the investment world; it becomes one of interest to all manufacturers and exporters, and has a bearing upon wages and hours and conditions of labour as Trade Unions would see in pondering their predilections for international labour organisation. It is true that the article before us says that in a "particular instance" (the motor-car industry) there would be no fear that either America or England, by assisting Germany financially as suggested, would suffer from the development of German industry, yet it is also recognised that when some kind of co-operation between German and foreign capital is found, German prices of motor-cars will fall. This case is taken because Germany is not a large exporter of motor-cars and cannot be at present. But the suggestion is made that "without injury to the investing country, foreign capital could be profitably invested in many other German industries not engaged in export," and that the increase of efficiency in production would increase the purchasing power of the German market for imported goods. The A.E.G. has a large motor-car production branch. So that, after all, though Herr Mamroth speaks as a director of the A.E.G., he can hardly be seriously thinking of British investors finding the wherewithal to develop the electrical manufacturing operations of Germany, for custom has not described these as an industry "not engaged in export." Perhaps it is intended that foreign funds if found for the Berlin Company would be earmarked for motor-car work and not for the electrical industry, though it is easy to see that benefit brought to the motor-car works would also assist the electrical operations.

Herr Mamroth favours long-term loans from England rather than from America, because "New York is so far away." He holds that only when there is close international co-operation will Central Europe really recover; that when the sluggish economic life in Europe is accelerated, "foreign capital will . . . have a direct interest in the prosperity of German industry, and will fructify it through working for its modernisation and rationalisation"; and, finally, that "the exchange of technical experience between rival countries that proved so fruitful before the war will again become a recognised part of our international economic system."

We quote the foregoing views, as it has been our habit for many years past to place before British electrical readers the reported opinions of leading electrical men in Germany regarding industrial affairs. We do not know that they really carry us very far, but they may assist British electrical and allied manufacturers in the deliberations in which we believe they are constantly engaged regarding possible adjustments of relations between this country and parts of Central Europe.

Municipal Tramway Matters.

The Municipal Tramways Association is to be congratulated on the very successful conference, of which a report is concluded in this issue; doubtless, as in the case of the I.M.E.A., the attractions of Brighton contributed to the popularity of the occasion, but apart from that factor, the conference gave abundant evidence of vitality and confidence in the future of tramways as the most efficient means of urban transport, which we believe to be fully justified.

It may be suggested that the change of name to "The Municipal Tramways and Transport Association (Incorporated)" is ominous of a coming change of transportation methods; but this is not the case. It merely implies that the municipal tramway managers have no intention of relying solely upon railed tracks, but are determined to move with the times and to adopt whatever aids to locomotion may present themselves. Already many undertakings possess considerable fleets of motor-omnibuses, and not a few have adopted the railless trolley-bus on certain routes; as trading undertakings they are logically entitled to avail themselves of all such auxiliaries as will increase the efficiency of their services and minister to the convenience of their customers. Tramways have been attacked in certain organs of the lay Press with a ferocity only equalled by the ignorance and irresponsibility of the allegations, but the Ministry of Transport, the London Traffic Advisory Committee, and the municipal authorities generally have declared their confidence in the soundness of the tramway system of transport, and the chairman of the Advisory Committee has explicitly stated that on the instruction of Parliament the Committee will give protection to tramways. We may point out in passing that if the tramways were relieved of the unfair burdens that are still thrust upon them, they would need no protection.

But it must not be thought that tramways and tramcars have reached perfection or anything like it; in

truth, as Mr. A. R. Fearnley indicated in his paper, tramway engineers have much to learn from the makers of motor-'buses, and we were pleased to publish recently particulars of notable improvements that were being introduced by the London Electric Railways on their tramway system. Mr. C. J. Spencer has on previous occasions pointed out in detail the wide scope for improvement that there is in tramway practice, and we should recommend other managers to "keep an eye on Spencer."

It must be borne in mind, too, that the handicaps under which the motor-'bus has hitherto laboured are being gradually lightened; its increased carrying capacity and speed, the introduction of covers on the upper deck, improved brakes, and comfortable seating, are factors which cannot be ignored, and at the same time its running costs have been brought down so far that they are not greatly in excess of those of tramcars. There is all the more reason, therefore, for the tramway associations to do their utmost to obtain relief from the cost of maintaining the pavement in good order for the benefit of other traffic, and from the other disabilities to which they are exposed.

One effective method of reducing operating costs was well illustrated by Mr. Jas. Dalrymple's paper on stopping places and speeds. There can be no doubt that the maintenance of high average speed is essential to the success of a transport service nowadays, and so much time is inevitably lost at every stop that the fewer the stops there are the better—within reasonable limits. The significance of this factor was driven home by Mr. J. K. Bruce, who stated that on the L.C.C. system alone, if one second could be saved on the average at each stop, an economy of £20,000 a year would be effected; and an increase of the average speed from 8.44 to 9.6 m.p.h. had resulted in a saving of 230 cars, representing a capital outlay of £700,000.

With regard to tramway finance, we cannot endorse the view of Alderman R. A. Smithson that the bleeding of the tramways for the relief of the rates is justifiable, unless it be to repay rate assistance already received. Here, again, the fact that the tramways maintain the roadway and thus relieve the rates to an important extent must be considered; were it not so, the paving would have to be maintained out of the general rates. Moreover, in many cases the tramways are compelled to carry workmen at reduced fares, involving a heavy loss of income which ought to be borne by the town as a whole; and in some instances they have been debited with part of the cost of street improvements. These burdens having been imposed upon the tramways, which nevertheless are often called upon to meet the competition of motor-'buses, it is unjust to deprive them of the profits which ought to be devoted to reserve and to the renewals that are now so urgently needed, the useful life of cars and rails in many undertakings having expired. As Mr. H. P. Stokes pointed out, one sees corporations borrowing money for renewals at a high rate of interest and at the same time allocating sums from tramway profits to the relief of the rates!

In view of the overloading with unfair charges, the milking of the profits, and the competition of motor-'buses subjected to neither handicap, it is a wonder that tramways ever show a profit at all. But when they do, let it be remembered that those profits have been provided by the passengers, mainly drawn from the poorer classes of the community that owns the tramways. Is it right to tax them in particular for the benefit of the general body of ratepayers?

Mining Electric Locomotives.

The announcement of the result of the competition for a prize of £1,000, offered by Mr. Charles Markham for the best type of locomotive for use underground in coal mines, was an event of considerable interest and importance not only to electrical engineers but also to the mining industry. As stated in our issue of September 18th, the judges decided to award the undivided prize to Messrs. Joseph Booth and Brothers, Ltd., whose design was the best of those submitted; but we have reason to believe that several of the competing locomotives possessed valuable features, and therefore we are publishing descriptions of them all, commencing, of course, with the winning design in this issue.

In the United States, we believe, electric locomotives have long been in extended use for mining, but the conditions generally prevailing there are very different from ours. The coal seams are much thicker, and gas is less prevalent, so that the use of trolley locomotives is practicable. In this country, on the other hand, most of the best seams have been worked out; the seams now worked are usually thin, the gradients are severe, and the presence of gas forbids the use of the trolley. Hence storage battery locomotives are the only alternative to rope haulage and animal power.

The necessity for the utmost economy in mining, for reducing to a minimum the use of muscular effort, whether human or animal, and for speeding up transport, led to the initiation of this competition, which has been very fruitful of result. We do not anticipate that there will be an immediate revolution in underground transportation—the use of electric locomotives is not unknown in British collieries—but the door has been opened, and we hope that steady progress will be made towards the general adoption of battery traction. Not least of its advantages will be the release of the pit ponies from their gloomy environment, which will gladden the hearts of all lovers of animals.

Electrical Benevolence.

The approach of the annual Festival Dinner of the Electrical Trades Benevolent Institution is brought to mind by the receipt of a circular letter from the President of the Festival—Mr. Edgar S. Barralet—appealing for support to the funds of the Institution, and pointing out that the ever-widening development of the electrical industry makes it certain that increased calls will be made upon its resources.

Fortunately the expansion of the industry, though it brings greater liabilities, also brings with it a larger field from which to derive support to meet them; but it cannot be expected that these new areas will bear fruit in due season unless the seed is sown, and it is incumbent upon us all to scatter that seed as widely and efficiently as possible. We would not reproach our readers with indifference to this duty—doubtless many of them already do their bit, and we know that some of them do a great deal of work for the cause; but it is certain that what is done is as nothing compared with what might be done by hearty goodwill. The electrical industry, even in these days of dull business, is comparatively prosperous, but its Benevolent Fund is absurdly small in comparison with the magnitude of the industry and the demands that must surely be made upon its benevolence in the near future. A fund of £100,000 would not be a penny too much.

We would also urge those who are in a position to do so to bring the matter to the knowledge of their associates, the majority of whom have probably never heard of the E.T.B.I., and have no notion that its existence is of direct concern to themselves; let them post notices in their offices explaining the objects of the fund, and summon meetings of employés—those who are not otherwise provided for—and thus sow the seed which will result in a large crop of new members. The cost to the members is very small compared with the benefits that are offered, and we believe that the only reason why the roll of actual members is not much larger is that the potential members have never been told about it. In this way, with little effort and less expense, employers, managers, and foremen can do good service not only to the Institution, but also to the employés.

Surely it is a small thing to ask of them! They go to great lengths in promoting the physical welfare of the workpeople by providing canteens, clubs, sports grounds, &c. Let them also give them the opportunity to protect themselves against penury in time of sickness and adversity by becoming members; and we further claim their support for the capital fund, to provide pensions for the old and disabled.

Electricity in Decorative Art and Applied Industry.

The Paris International Exhibition.

By T. RICH.

An International Exhibition of Decorative Art and Applied Industry is at present being held in Paris; it will remain open until the end of October. It occupies some of the open spaces around the Alexander Bridge, near the Place de la Concorde; it includes the Grand Palais where the annual Art Salon is usually held, covers the Invalides Gardens, and stretches to the west along both banks of the river for several hundred yards. It is not nearly as big as the Exhibition of 1900 or as imposing as Wembley, but all the same there is a good deal to be seen of interest. The Exhibition is backed by the French Government and the Municipality of Paris, a great deal of the cost being covered by the sale in advance of numbered "bons," containing a number of admission vouchers, the bearers of the "bons" having the right to a chance in prizes in lottery drawings; without lotteries or lotteries disguised as guessing competitions it seems to be difficult to run exhibitions nowadays.

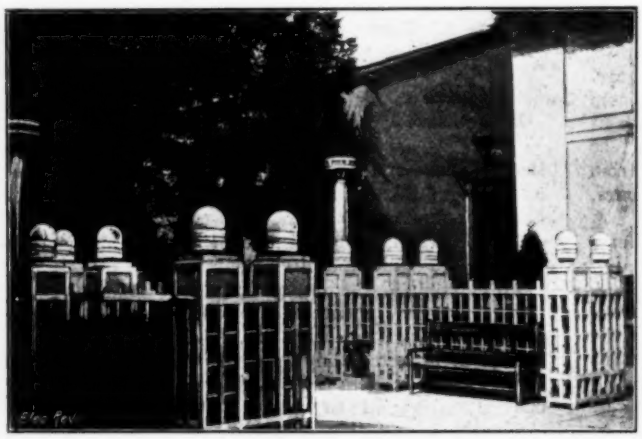


Fig. 1.—Garden Illumination.

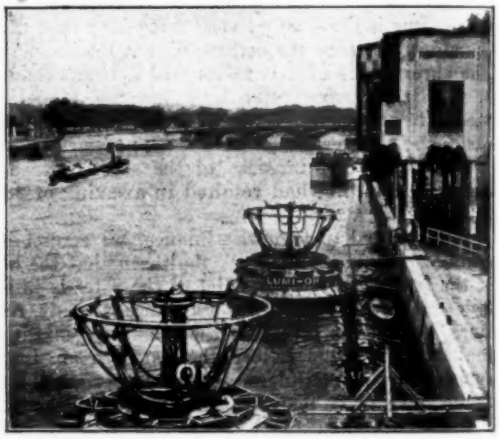


Fig. 2.—Floating Electric Fountains.

Illumination and Motive Power.

A great feature of the Exhibition is the tasteful way in which it is illuminated at night, many of the lighting fixtures attached to independent buildings being of a pleasing character. The general lighting is assured by 40 double-arm standards with two lights each of 1,500 c.p., 100 single standards each of 1,500 c.p., and 200 gas standards of 1,200 c.p., many of the latter apparently having been in place before the Exhibition was built. Many of the standards are of armoured concrete; they look clean and neat. Besides the lamp standards, many of the buildings and gardens have special illumination effects. Fig. 1 shows one of the courts in the Invalides Garden section, lighted by hemispherical opalescent globes placed on the top of an ornamental trellis work; the effect is very pleasing. There have been very few cases where the intensity of illumination installed at this Exhibition has been approached by exhibitions or other public attractions elsewhere, a total of 9,000 kW being arranged for over an area of 30 hectares or about 70 acres. Apart from gas mains, more than 16 kilometres (about 10 miles) of trenches have been opened for the laying of high, medium, and low-pressure mains, and more than 150 branches have been put in to various sections, buildings, pavilions, and kiosks. Ten sub-stations connected to 12,300-V mains have been constructed, and 40 transformer points for 3,000 volts.

The distribution generally is alternating current at $41\frac{2}{3}$ periods, 110 volts and 220 volts (Paris and the Mediterranean districts being exceptions to the usual 50 periods), either single-phase or two-phase, the maximum voltage in the ordinary way between any two conductors being 220 volts. Where, however, motors of 3 kW consumption and upwards are used, either single-phase at 220 volts or a two-phase system with 220 volts across each phase is arranged for. In general, the regulations of the French Union of Electrical Associations have been applied to the electrical wiring and installations. In cases where the power requirements of any particular building exceed 25 kW, a separate transformer is installed in a brick cabin or compartment.

For the purposes of comparison, it is interesting to note that electricity is supplied to private owners of stalls and pavilions at the Exhibition at 93 centimes a kWh for lighting and 67 centimes for other purposes, based on a coal cost of between 125 and 135 fr. a metric ton, subject to an increase or decrease of 2.7 centimes for each ten francs by which the cost of coal varies above or below these limits. Those buying electricity at high pressure have a rebate of 20 per cent. Consumers have to guarantee for a minimum of 250 hours, the output of the meter installed, and have to pay a small fee, 5 cts., for lighting and 3 cts. for power for the current not taken up to that quantity.

Illuminated Cascades.

In the Middle Ages, Italy with her supplies from mountain streams was the home of many fountains, and in France in the palmy days of the Monarchy a number of ornamental fountains were constructed. Many of those who visit Versailles and see the fountain display on special occasions do not realise that the water is pumped up from the Seine by means of waterwheel-driven ram pumps installed over 150 years ago, the foundry work and general engineering work being, for their date, truly remarkable.

It might be remembered also that practically the first display of an electrically illuminated fountain was at the later exhibitions at South Kensington in the 'eighties, when an arc lamp, with changing coloured slides, was used to light a single jet, the arrangement forming one of the principal attractions at the Exhibition for the fashionable world at night.

At the Paris Exhibition an illuminated cascade has been arranged on both sides of the Alexander Bridge: also two circular floating buoys and two barges have been

arranged to give illuminated floating fountains; there is in addition an illuminated fountain in the Invalides Gardens. The cascades and floating fountains and barges have been designed and constructed under the supervision of Mons. E. Vedovelli, who was also responsible for the illuminated fountains at the Paris Exhibition in 1900.

To supply the cascades, a transformer station of 600 kW is arranged on the south bank of the river under the bridge; power at 12,000 V two-phase is transformed down to 220 volts with the neutral earthed, some of the cables connected up being under water. Two motors, each of 200 h.p., 800 revs., made by the Cie. Générale Electrique, of Nancy, directly coupled to centrifugal pumps, are arranged, one for the up-stream side and the other for the down-stream side of the bridge. On each side water is drawn from the Seine and pumped through a main 300 mm. dia. (11.8 in.) at a pressure head of 18 metres (59 ft.), the water pumped amounting to about 400 litres a second (88 gallons). Sixty secondary branch mains are placed along the face of the bridge, each with 150 holes 3 to 5 mm. diameter, that is to say, there are 9,000 jets on each face; the flow in each secondary main is regulated by means of valves.

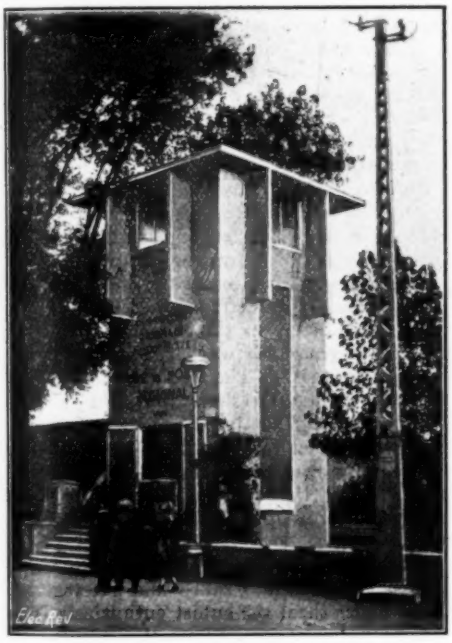


Fig. 3.—Regional Transformer Cabin.

Fig. 4.—Interior of Village Transformer Cabin.

In the rear of the jets, in a position so that the direct light is shaded from the eye, a series of 70 reflectors are placed; these, which are made of silvered copper, are parabolic in shape and 40 cm. (15¾ in.) in diameter; in the focus of each is placed a "Luxor" incandescent lamp of 2,000 candle-power.

Many of these projectors are covered with coloured glass disk screens so that various colour effects can be given at will. Those projectors which are not fitted with coloured screens are provided with white glass front windows to protect the mirrors from the sulphurous smoke from passing tugs. Owing to the heat from the high-powered lamps, each reflector has a double wall in which cooling water is circulated, the reflectors' circulation being arranged in series on each side; a special pump is provided for the purpose, taking its water from the cascade mains. The lamps are arranged in groups on each side so as to balance on the two-phase mains. The cascades are started at nightfall and continue until the close of the exhibition; they are stopped when a boat has to pass, although some barges like the excitement of passing under the dazzlingly illuminated cascade.

Floating Electric Fountains.

Each fountain consists of a buoy-shaped vessel made of sheet steel, 7 metres (about 23 ft.) in diameter, drawing 1 metre of water (see fig. 2); it is arranged with a deck, on which are placed the various pipes and jets, access being obtained to the interior by means of a hatchway. There are three electrically-driven pumps inside each buoy, one of 200 h.p. which can give a pressure up to 70 metres head (100 lb. per sq. in.), a second of 60 h.p. with 30 metres, and a third of 6 h.p. for 6 metres.

The large pump is used to supply (1) a sheaf jet 80 mm. in diameter; (2) an effect like that of a sea shell; (3) an effect produced by eight inclined jets on a revolving ring, the turning moment being produced by the reaction of the jets; (4) eight parabolic jets.

Special precautions have been taken to prevent water-hammer when operating the various changes.

The second pump operates a sun effect and two crown-shaped water rings. The valves controlling all the different effects are of a special character, the actual operation being carried out with the aid of a sort of barrel-organ equipment of cams and plungers which can be arranged in the required sequence in advance. The third small pump is used to prime the pipes when starting, and to act as an auxiliary pump for some of the effects. For use in conjunction with the fountains illumination effects are produced by means of port-holes placed in the deck of the floating buoys. Eighty-four projectors are used, with elliptic mirrors giving an angle of dispersion of 60 deg. Each projector is fitted with a "Luxor" incandescent lamp of 3,000 candle-power; the mirrors, which are 30 cm. (11¾ in.) in diameter, are also arranged for water cooling, the circulating system branching off the main from the 60-h.p. pump. Each projector is surmounted by an arrangement of red, blue and yellow glasses mounted in slides, the 252 coloured glasses being operated with the aid of mechanical gear.

A special system of ventilation is used owing to the large output in a confined space; there is also electrically-driven mechanical gear by which some of the moving effects on the deck are operated.

Owing to the noise in a confined space, the telephone system by which instructions can be given to the operator has been the subject of a special study. The De Las Telephone Company supplied special telephones, the operators wearing special headpieces. A difficult problem has been to find a means by which the buoys can be swung into mid-stream, the running position of one being mid-stream above the bridge, the other being in a similar position below. The first is hauled into place and back by means of cables laid on the bed of the river and operated by a suitable windlass. The latter, which is laid up to the bank up stream in the day time and which is placed down stream when under operation, is hauled back up stream by means of a cable attached to the first buoy, the force of the current being at first considered sufficient to carry it into place down stream; owing to the lowered force of the stream, arrangements have been made by which a large jet of water under the water line is provided by the large pump, so that the buoy can be propelled into its place. Another problem to be solved was the cable connection of each buoy to the shore, as it would be inconvenient to place the cable on the river bed. Owing to the large horse-power required, the cables are in multiple; they are supported by a series

of floats (apparently made up of a number of large steel oil cans placed upright) fixed in frames, the floating frames being spaced 2 m. 50 (8 ft. 3 in.) apart.

There are two barges with fountains on their decks; each barge is 20 metres long, 3 metres wide, and about 80 cm. above the water level. All the apparatus for the operation is placed on the deck. Each barge has one motor of 60 h.p., directly coupled to a large pump giving a pressure head of 35 metres, and a motor of 40 h.p., giving a pressure head of 15 metres.

Each barge has a number of jets, some of which are arranged so as to obscure the actual shape of the barge. The hydraulic effects are fixed once and for all, but the lighting effects, which are arranged by means of "Luxor" lamps of different colours, are varied by means of continuously operating automatic gear for switching groups in and out. One must say that it is difficult in a description to do adequate justice to the remarkable effects obtained, though few of those who enjoy the spectacle would realise the ingenuity in design and skill in construction necessary to obtain the beautiful combinations of multiple water jets and colour which can be produced and changed so rapidly.

Transport.

There are two long narrow buildings on the left bank devoted to transport, the decoration and lighting of railway carriages and steamer cabins being special features. The six great railways in France, the North, the Western State, the Paris-Lyons and Mediterranean, the East, the Orleans and the Midi, have carriages on view. The last four carriages are of the first class; the lighting arrangements, especially of the last two, are more artistic than those generally met with in railway-carriage design.

In the steamship section, several of the leading French steamship lines show furnished and decorated "cabins de luxe." There again the artistic lighting is a feature. In one of the cabins the lights are placed behind ornamental white glass screens over cupboard and other doors; lights are also placed in one case in a chamber in the ceiling.

Transformer Cabins for Overhead Mains.

There is a section termed the Model Village, with school, mairie (town hall), an inn, and various shops, a feature being two transformer stations for connection to overhead lines, one being for a village, and the other for the connection of a district to branch district distributing mains. These transformer posts were designed and equipped by the Compagnie Générale d'Electricité, of Paris. Both posts are made of armoured concrete, high enough for the high-pressure mains to enter through round holes in glass panes, the panes being sheltered by deep overhanging cornices. Both posts are arranged as exhibits only, not being connected to any mains. The village transformer post is arranged on the incoming h.p. 3-phase, with leads to earth, lightning arresters and resistances on a branch; then on the mains, choking coils, section links, tubular fuses, and then connected with the h.p. transformer, 15 kVA, 5,000 V to 190/110. On the low-pressure side there is a small switchboard with a pilot lamp and multiple pilot switch (the pilot lamp can naturally be exchanged for a plug for a portable voltmeter when required), fuses, and a low-pressure switch. It is to be noted that there is no h.p. auto-oil switch and no ammeter on the l.p. side. If the l.p. switch is opened, the only current remaining is that due to the magnetising current of the transformer that the section links can look after quite safely (see fig. 4).

In the regional station the incoming mains are 22,000 V; there are two transformers, 22,000 V to 5,000 V, and two high-pressure auto oil switches, with the necessary links and arresters (see fig. 3). This cabin is designed to deal with two 5,000-volt overhead distributing mains. In both cabins the h.p. bare conductors are supported on insulators, wire guards being used to protect a visiting operator. The arrangements are distinctly neat, though in the former case perhaps more expensive than many small French communities can afford, the use of pole transformers being certainly on the increase in France. The cabins in question are distempered white inside, and for the purpose are roomy; they are arranged so that they can easily be kept clean.

On the ground floor in the "Salon" exhibition building there is a small section devoted to French makes of artistic electric lighting fittings, bronze and gilt brass standards, pendants and brackets, with cut glassware forming a number of the exhibits. The exhibits in this section are inclined to be too ornate and somewhat heavy; some fittings of simple artistic design in black, made up with square cow-bell shaped shades, exhibited by M. Max Le Verrier, are, however, particularly pleasing.

Arts and Crafts Schools.

On the first floor there are a number of rooms devoted to French secondary arts and crafts schools. In the former a number of cubicles are to be seen designed, decorated, and in some instances furnished by schools in various parts of France, local activities showing their influence on subject and design. In the sections allotted to craft schools, the displays devoted to electricity and the making of electrical machines and fittings are somewhat disappointing as compared with those of schools devoted to iron and brass foundry work, smithy work, carpentry and joinery, turning and fitting, although some of the electrical craft schools in France are noted for the good work they do. If these exhibits are anything to go by, then the French people, in their preparation for the supply of skilled workers to meet world competition, are not allowing the grass to grow under their feet; it should be remembered in this respect that during the war many industries sprang up in Southern and South-Eastern France, with corresponding demands for electric power supply, and many peasants in those parts have turned out very industrious workpeople. An instance of this can be seen in the electrical engineering industry started since the war at Tarbes, on the foothills of the Pyrenees. The section devoted to manual instruction tends to show that the French workers, instead of crying out for their alleged rights, and waiting for the moon to assist in the growing of corn that has not been sown, are setting to work to train up young people so that their nation can rapidly make up for the ravages of war by the skill and industry of its operatives.

Taking the Exhibition as a whole, one would think that the "Cubist" cranks of France had got together and called in to assist them the cubist enthusiasts from a number of different countries, as with the exception of Italy, Spain and Japan, in architecture, sculpture, decorative and textile art, it would in a number of instances be difficult to imagine exhibits so uniformly unrepresentative of the true spirit and mentality of the peoples and countries concerned. This applies especially to the design of the British Building; if it were not for the Royal Arms outside the building, few people, British or otherwise, would know what it was intended to be, although the long-suffering British taxpayer has to foot the bill.

In matters connected with electric lighting, while at Paris there is nothing to compare with the "skew-whiff" globes of Wembley, the native talent has broken through the veneer of morbid impressionism which can be seen in so many sections, and effects are produced which are highly artistic and pleasing; in engineering, the rolling stock section, and the machinery required for the operation of the fountains are evidences of healthy progressive design. One cannot travel through Northern France to Paris by day without noting electrical and engineering works in progress, which illustrate the true mentality of the people.

The Exhibition is worth a visit, especially as the lighting effects show up to greater advantage now that the nights are darker. For those who are visiting Paris for the first time it may be noted that by travelling *via* Newhaven one lands at the St. Lazare station in the West End close to the Exhibition, and within easy reach of a number of reasonably priced hotels.

Electricity Supply in Salford.

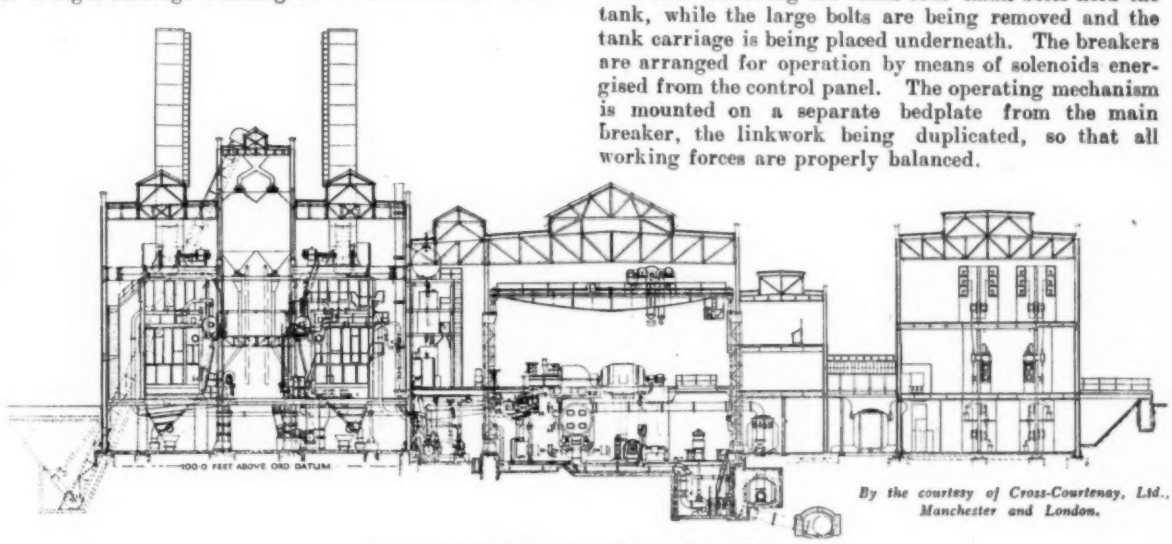
The Agecroft Power Station.

(*Concluded from page* 503.)

The supply of energy for auxiliary power and for lighting is obtained from one 600-kW geared turbo generator and two motor-generator sets of 600 kW each. The supply to the motor-generators is taken from the main 33,000-volt system through transformers which step down to 6,600 volts. An electric storage battery having a capacity of 1,720 ampere-hours at a three-hour discharge rate, and an emergency discharge rate of 2,000 amperes for fifteen minutes, has been supplied by the Chloride Electrical Storage Co. The battery, which is controlled by reversible boosters, is also used to operate the high-pressure switchgear.

The whole of the turbine-house plant, comprising main generators, house-service plant, condensers, switchgear, transformers, and auxiliaries, has been supplied by the Metropolitan-Vickers Electrical Co., Ltd.

The main transformers comprise ten single-phase units of the outdoor oil-immersed self-cooling type, mounted on rollers whereby they can be rolled out on to a bogie carriage running on a sunken track at the



By the courtesy of Cross-Courtenay, Ltd., Manchester and London.

Fig. 15.—Sectional Elevation of Agecroft Power Station.

correct level for easy removal. The units are of 4,667 kvA per phase, and are arranged to form three 3-phase banks of 14,000 kVA per bank with one single-phase unit as spare. The banks are delta-star-connected and are wound for 6,600/33,000 volts. Each bank of transformers is connected direct in the cable line between the 6,600-volt terminals of the alternator and the 33,000-volt switchgear. Two transformer units for stepping-down from 33,000 volts to 6,600 volts are employed for local service and auxiliary plant.

The switchgear is noteworthy in two respects, namely, it is one of two or three stations in this country in which all the switching for the main circuits is carried out at 33,000 volts; and the oil circuit breakers are amongst the largest installed from the point of view of short-circuit rupturing capacity. The whole of the high-pressure switchgear is contained in a three-storey detached building, 101 ft. long by 49 ft. wide by 64 ft. high. The 33,000-volt switchgear is accommodated in two rows of cubicles running longitudinally along the building, and the auxiliary and local service gear at 6,600 volts is mounted in a set of cubicles placed at right angles to the main gear, and situated at one end of the switch room.

The 33,000-volt gear is mounted in cubicles constructed of brickwork, fitted with moulded stone barriers and shelves to maintain phase separation. The top floor of the building carries the main and auxiliary bus-bars, with the circuit isolating and selective switchgear. The middle floor is reserved for the main oil circuit breakers, while the potential and current transformers required for instruments, with the cable isolating switches, are situated on the ground floor.

The oil circuit breakers are of a new design, embodying the results of extensive short-circuit tests. They are arranged on the middle floor in a central aisle, and as the design obviates the necessity of any cubicle structure, a compact and neat arrangement is obtained. The breaker is built round a single top frame, to which the oil tanks are secured by substantial hanger bolts. The design of the top frame is such that a separate air chamber is formed for each pole, and each chamber is fitted with a special vent to ensure that all gases are expelled after the breaker has operated under fault conditions.

The steel oil tanks are of circular shape, arranged so that when removing the tanks four small bolts hold the tank, while the large bolts are being removed and the tank carriage is being placed underneath. The breakers are arranged for operation by means of solenoids energised from the control panel. The operating mechanism is mounted on a separate bedplate from the main breaker, the linkwork being duplicated, so that all working forces are properly balanced.

Special provision has been made to deal with the great electromagnetic forces that may be transmitted to the operating gear without reducing the sensitiveness of the trip gear. The estimated rupturing capacity of the breakers under fault-conditions is 1,500,000 kVA.

The isolating switches are of the pole-operating type, and are fitted with locking catches to prevent them from being blown open by the magnetic forces set up under heavy current conditions. The control board is situated in a room overlooking the turbine house, and is of the desk type, constructed of enamelled slate on wrought-iron framework. Each panel is equipped with the necessary instruments, control switches, and the indicating lamps required for the various circuits. The circuit breakers are operated by push-button switches in conjunction with indicating lamps and, in addition, separate lamps indicate to which set of bars a circuit is connected. These indicating lamps are combined with an arrangement of miniature bus-bars mounted on the sloping section of the desk, which enables the operator to determine at a glance the connections of the circuit. Duplicate synchronising gear is provided, and an automatic voltage regulator controls the machines and maintains the voltage of the system at a constant value.

A set of Chadburn's ship's telegraph instruments provides communication between the control house, the turbine house, and the boiler house.

The alternators and transformer groups are fitted with the Merz-Price circulating-current system of protection, which automatically disconnects the machine and transformer from the bus-bars in the event of an internal fault, and also operates the automatic field-breaking switch, limiting any damage to the machine to a minimum.

The feeder circuits are fitted with a balanced system of protection of the Merz-Beard type, in which the pilot cables are compensated to increase the sensitiveness of the system by reducing the effect of capacity current on the relays.

The neutral points of both the 6,600-volt and the 33,000-volt systems are earthed through resistances. The switches controlling the earth connections are electrically operated from the control desk, and indicators show which generator or transformer neutral is connected to earth. A bell alarm device is fitted to each resistance to announce when any appreciable current is passing through the earth circuit, while an automatic annunciator indicates the system upon which the fault has occurred.

The instrument transformers are of the oil-immersed type. Limiting resistances are fitted in all potential transformer circuits to prevent a rush of current in the event of failure. The bus-bars are in duplicate, divided by bus-bar sectionalising switches. At this point, reactances of the air-core concrete type are inserted to limit the amount of energy which can pass between the sections. Provision is made for the addition of further reactance between sections as the station is extended.

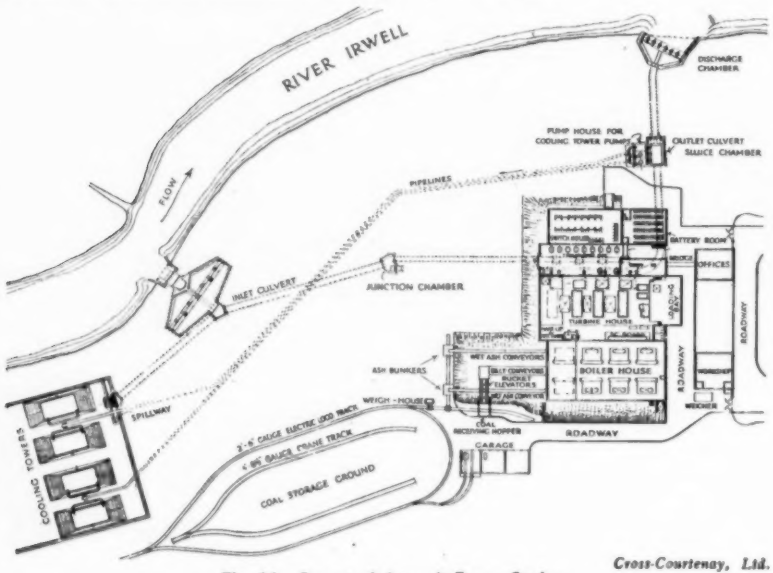


Fig. 16.—Layout of Agecroft Power Station.

Cross-Courtenay, Ltd.

The auxiliary plant is controlled from a 27-panel switchboard on the turbine floor in the power station. The panels are fitted with air-break circuit breakers, knife switches, and instruments. Duplicate bus-bars are provided, and all circuits are arranged so that they can be connected to either set of bus-bars, or the bars can be coupled in parallel should this arrangement be required.

At present three main lines for transmission at 33,000 volts are laid to the Frederick Road works, where energy is delivered through step-down transformers to the 6,600-volt distribution system. The transmission lines comprise three-core cables, each conductor having a sectional area of .3 sq. in. The cables were manufactured and laid by the British Insulated & Helsby Cables, Ltd. The step-down transformers are arranged in three banks of 18,000 kVA capacity per bank.

The power station has been constructed to plans and specifications prepared by Mr. J. A. Robertson, consulting engineer, who has also been responsible with his staff—with Mr. T. Brighouse as chief assistant—for supervising the construction and equipment.

Messrs. C. S. Allott & Son have acted as consulting engineers to Mr. Robertson, for the civil engineering work and buildings. Mr. D. E. Laing has acted as resident civil engineer.

During construction, and in the starting-up of the station, the consulting engineer has had the active co-operation of Mr. S. J. Watson, the borough electrical engineer, and his staff, of whom Mr. E. H. L. Dickson is deputy engineer, and Mr. J. Collinge and Mr. L. Romero, works superintendent and distribution engineer respectively.

The area of supply in the borough of Salford covers 5,202 acres, with a population of 239,000. In 1907, the Prestwich Provisional Order was leased to the Corporation for a term of 21 years, and has since been extended, thus adding to the supply area 2,448 acres with a population of 18,750.

The output last year was about 6 million kWh for lighting, &c., 28 millions for power, 10 millions for traction, and ¼ million for street lighting—the total being nearly 45 million kWh. There were 9,824 consumers, and the maximum load was 18,647 kW. For power purposes 1,038 consumers have installed 3,561 motors having an aggregate capacity of 43,317 h.p.

Fifty transformer sub-stations are connected to the 6,600-V system, with a capacity of 16,530 kVA of static transformers for alternating-current supply, and 16,850 kilowatts of rotary converters for direct-current supply. Twenty-seven sub-stations having a total capacity of 1,329 kVA are in use for converting the 3,300-volt single-phase supply to low pressure for distribution.

The capital expenditure at March 31st, 1925, amounted to £1,682,398, of which the sum of £709,354, equal to 42 per cent. of the total outlay, has been redeemed. The net capital liability was therefore £973,044. The total sums transferred from the net profits to the reserve and renewals fund, or accumulated by the investment of this fund, amount to £206,645. Of this sum £78,168 has been appropriated for work which would otherwise have necessitated an increase in borrowing powers, £66,848 has been utilised to improve the efficiency of the plant, and the balance of £61,629 remains in hand.

In addition to repaying certain deficits which occurred in the early years after the undertaking was established, a total sum of £154,584 has been transferred to the rate fund in relief of the rates.

The foregoing particulars are derived from a handsome souvenir which was issued at the opening ceremony.

Diesel-Electric Locomotives in Canada.—A special correspondent of *The Times Trade and Engineering Supplement*, at Montreal, states that the Canadian National Railways have been testing new types of cars operated by electricity developed by a generator within the body of the car. The cars are of two types—one small, with a body 60 ft. over all in length and capable of drawing a trailer; and the other heavier and with an articulated body, 102 ft. in length, which really consists of two bodies set on three four-wheel trucks. One of the new cars of the light type made the trip from Toronto to Montreal, a distance of about 335 miles, in only a little more time than is required for the regular trains drawn by steam locomotives. The experiments with these Diesel-electric cars represent an endeavour to escape the high fuel cost of locomotives dependent upon coal. Petrol-operated cars and, later, storage battery cars were built and put into operation on some short lines, but did not prove altogether satisfactory. The next step has been the Diesel-electric car, and the management of the Canadian National Railways claims to have proved from tests made over a period of months that it represents a type of motive power economical and serviceable in operation and well suited to suburban, inter-urban, and branch-line traffic, and that it may prove an effective competitor of the motor omnibus and lorry. In a recent test the fuel consumption of the lighter Diesel-electric car averaged one gallon per 4.6 miles, representing about 10 per cent. of the cost of fuel for similar steam operation.

Mining Electric Locomotives.—I.

The Markham Prize Battery-Propelled Machine.

The Brodsworth Colliery, near Doncaster, was the centre of great interest in May last when five electric storage-battery locomotives were tested in competition for the £1,000 prize offered by Mr. Charles Markham for the most suitable model for use in mines. The Mines Department took charge of the experiment, issued the technical requirements and competition conditions, and appointed Mr. A. M. Clegg to act as secretary. The adjudicators were: Messrs. J. A. B. Horsley, H.M. Electrical Inspector of Mines, representing the Mines Department; Roger T. Smith, of the Institution of Electrical Engineers; Roslyn Holiday, of the Mining Association; and Sidney Bates, of the Institution of Mining Engineers. Mr. Herbert Smith, of the Miners' Federation and the Yorkshire Miners' Association, was prevented by illness from acting as adjudicator. An official report on the tests is to be issued by the Mines Department.

The competition was international, but the machines which took part were all of British manufacture; of the ten models submitted five entered the final competition, and for the tests track rails were laid in a field and conditions were created approximating as nearly as possible to those of the underground pit workings. Preliminary to the running tests exhaustive battery tests were carried out by the Doncaster Collieries' Association. The prize-winning locomotive is described below, while the four others, each of which possesses points of merit, will be referred to in a later article.

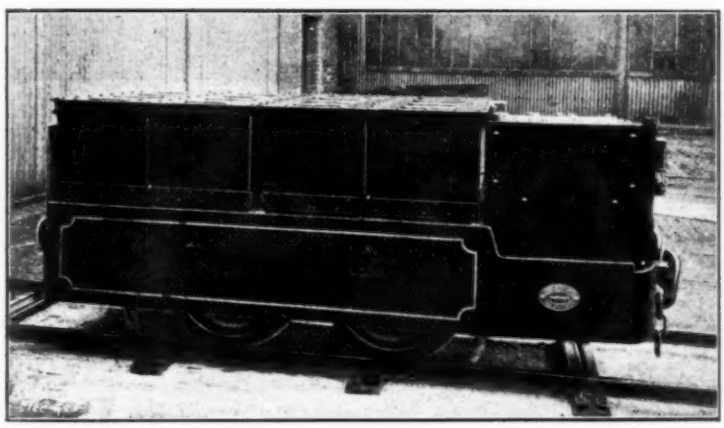


Fig. 1.—Side View of Prize-winning Locomotive, complete.

The "Union" Mining Locomotive.

This electric accumulator-driven machine was designed and built by Messrs. Joseph Booth & Bros., Ltd., of Rodley, Leeds, who have been building cranes since 1847, and have marketed several types of rubber-tyred industrial trucks. Although the machine illustrated in fig. 1 was specially designed to fulfil the conditions of the specification drawn up by the promoters of the competition, it cannot be said to be a new development of Messrs. Booth's, who have supplied locomotives for various classes of work both at home and abroad.

The radius of action of a locomotive is limited by the capacity of the battery; to reduce the loss of time which would be involved, in many cases, should the battery require to be re-charged during the working shift, which might result in the disorganisation of the whole haulage scheme, Messrs. Booth have patented a method of mounting the batteries. The cells, which are mounted in groups in hard wood crates, are housed in flame-proof mild steel boxes that are supported on rollers mounted on the locomotive frame, and locked in position by two pivot bars, one on each side of the locomotive, running the full length of the boxes, each being securely clamped by a single hinged bolt; the cables are taken in and out of the boxes by quick-releasing plugs. Should the battery become discharged at any inconvenient time, all that is necessary is to release the plugs and the one clamping nut, pivot the locking bar over, and roll the discharged battery off the machine, as indicated in fig. 2. A fully-charged battery can then be rolled into position on the locomotive and securely locked. The complete operation can be performed in less than five minutes.

The subject of a further patent is the fact that the locomotive consists of two units, *viz.*:—(*a*) The mechanical unit, consisting of the two axles and brake gear mounted on an inner frame, and (*b*) the electrical unit, comprising an outer frame carrying the motor, controller, resistance, circuit breaker, and all the electric cables. The outer frame is rigidly cross-braced with channels, which are carried on springs mounted in guides on the inner frame; tie bolts are provided through the springs to secure the two units together. This method of mounting relieves the electrical equipment, including the battery and also the driver, of shock due to the track, whilst for the purpose of overhaul the two units can be separated by unskilled labour, as no electrical connections are interfered with by the separation, and each unit can be dealt with by the department concerned. In the case of breakdown, the faulty unit can be replaced and repaired without the whole locomotive being placed out of action. When the battery has been rolled clear of the machine, the whole of the mechanism is visible for inspection, and each individual unit may be removed with a minimum of time and labour, while the simplicity of the whole construction is worthy of special note.

Power is derived from a single motor, manufactured by Messrs. Booth, and specially designed to fulfil the conditions laid down in the specification; it is of the four-pole type and the armature and commutator are of their standard type, being provided with pure mica insulation. The armature shaft is mounted on Hoffman ball- and roller-bearing, totally enclosed in dust- and water-tight housings. The motor is placed at the end remote from the driver, and transmits power through two flexible couplings and a cardan shaft to a free coasting worm and wheel on the axle nearest to the driver. This axle is of special alloy steel, oil hardened and ground to accurate limits, and is supported on Hoffman ball- and roller-bearings. The worm wheel is keyed to the middle of the axle and the worm is also supported on Hoffman ball-bearings, the whole being totally enclosed in a dust- and water-tight cast-steel case, the worm wheel being provided with an oil well. The projecting ends of the axle are tapered to fit the tapered bore of the wheels, which are secured by two keys at right angles and a clamping nut at the ends; they have cast-steel centres with rolled-steel tyres shrunk on.

The two axles are coupled together by connecting links placed at right angles and accurately balanced, and are provided with two substantial Hoffman ball-bearings at each end, mounted in dust- and water-tight housings. The coupled axle also consists of special alloy steel, oil hardened and ground, and supported on Hoffman ball- and roller-bearings in dust- and water-tight housings.

The brake gear, which operates on the rims of all four wheels, and is provided with a three-fold equalising device, is powerful and quick operating. The cast-steel shoes are lined with Ferodo, or similar material, and operated by the action of equalised cams, ensuring

equal pressure on all wheels by means of a screw and nut mechanism. A separate sand box is provided for each wheel, the valve construction of which is very simple, and the sand is conducted to the rails by means of india-rubber pipe, which cannot be damaged by derailment, or by striking any projecting object.

The inner frame consists of two steel castings, to which the axle housings and brake gear are bolted. Machined guides and detachable wearing strips are provided to receive the outer frame, and cross channels and sockets are also provided to receive the springs on which the outer frame is supported. Tie bolts pass through the centre of each spring, securing the two frames together, and subjecting the springs to sufficient compression to ensure easy riding. Should one or more of the springs fracture, the operation of the locomotive can be continued until such time as it is convenient to replace the broken spring. The spring-mounted draw hooks and buffers are important, as they reduce the shock to the locomotive, and especially the battery, when starting and stopping, as well as the strain on the links connecting the loaded tubs.

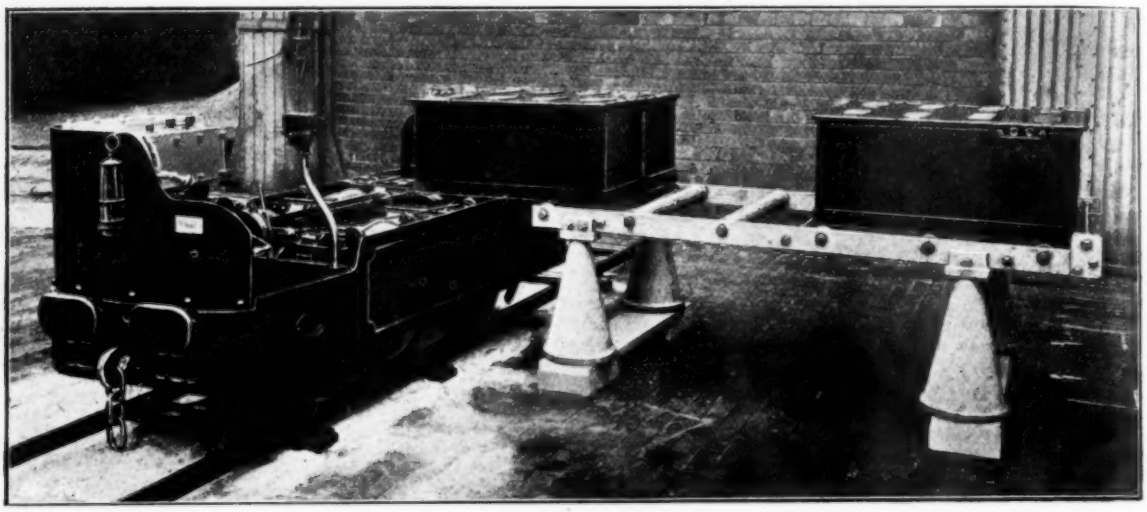


Fig. 2.—View showing one Battery Box off and one in process of removal.

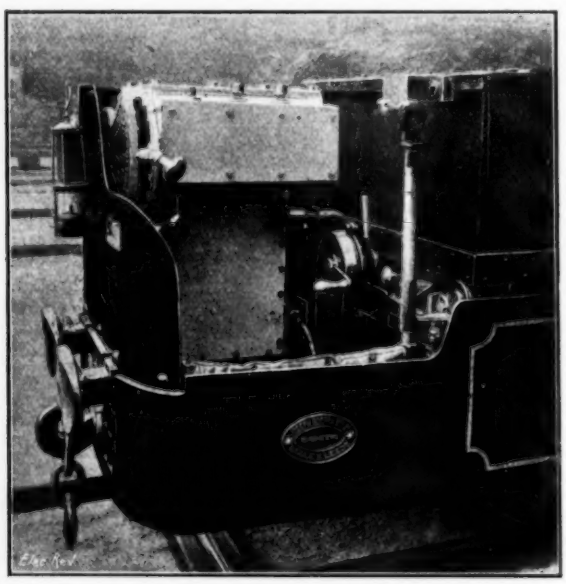


Fig. 3.—Driver's Well, showing Controls.

A circuit breaker of the quick-break, double-pole, free-handle type is mounted in front of the driver and the controller is immediately above it, being so designed that the drum fingers and finger bar inside can be removed as a whole without disconnecting any wires. This means that when it is necessary to clean the contacts, or to make any repair, a spare unit can be inserted in a few minutes without interfering with the duty of the locomotive while the necessary attention is being given to the damaged part.

The resistance, which is also supported on the outer frame unit, is of the "unbreakable" grid type, constructed of easily detachable units mounted in a flame-proof welded mild-steel case. The grids are insulated with special heat-resisting mica and cable connections are made by gunmetal sockets and lugs clamped to the grids.

The battery is housed in two units, which are supported on independent rollers. Each unit consists of two compartments having a ventilating space between them and rigidly riveted together, the object of dividing the battery being that a great radiating surface is obtained to dissipate the heat generated and to minimise the liability of a violent explosion occurring inside the battery compartment, as an explosion which may occur inside any one of the containers is localised to that container only. To facilitate ventilation and internal pressure relief, wire gauze and valve plates are provided in the cover plates. This point is also covered by one of the patents taken out for the machine. The Kathanode batteries were made by the D.P. Battery Co., Ltd.

Care was taken to produce a thoroughly flame-proof construction. All the electrical units are equipped with flame-proof terminal boxes, fixed insulated studs being provided for carrying the conductors from the terminal boxes into the main housings. All the cables are totally enclosed in steel tubing screwed into the terminal boxes on each unit. The whole machine is fire-proof, as any material which is liable to catch fire, or be affected by excessive heat, is encased; should any part take fire, it is impossible for the flame to reach the external air.

The general design of the locomotive has been somewhat improved since the competition was conducted, the overall dimensions now being:—Length 10 ft, width 3 ft. 6 in., and height 3 ft. 6 in. The road clearance between the wheels above the top of the rails is $5\frac{7}{8}$ in. The machine is capable of hauling a load of 5 tons on the level at a speed of approximately 6 m.p.h., or 20 tons at approximately 3 m.p.h., and has a starting pull of approximately 2,000 lb.

Electricity Supply in the United States.—The *Electrical World* recently published statistics of the output of electricity in the United States during the first six months of the current year. The total amount generated during this period was 29,104,105,000 kWh, as compared with 26,837,908 kWh in the equivalent period of 1924—an increase of 8.4 per cent. The revenue increased in approximately the same proportion to $716,400,000. The proportion of the energy generated by hydro-electric plant was 38.4 per cent. The production of hydro-electricity increased to a slightly greater extent than the output of steam stations.

The Electrical Industry of Mexico.

The Prospects of Revival.

By PERCY F. MARTIN, F.R.G.S.

One of the most interesting features in the electrical industry of Mexico is the fact that the same powerful influences that established, in 1892, the first power station in that Republic, still control one of the more important enterprises supplying light and power in that country. The pioneers in the transmission of hydro-electric power have maintained their interests through good years and bad, even amid what appeared to be altogether hopeless conditions. The organisation has been thorough and complete, and conducted with so much discernment that, with a revival of Mexican industries in general, the prospects of which have been considerably enhanced by the recent resumption of diplomatic relations between that country and the United Kingdom, the electrical industry in practically all branches should prominently participate.

Commencing with the construction of a hydraulic installation for the supply of power to a jute mill on the Rio Blanco, belonging to Lord Cowdray (then Sir Weetman Pearson), in 1892, a number of electrical companies providing light and power organised under the same or other British influences, have come into existence, having been nursed through Mexico's most troublous times, and, fortunately, having sustained very little damage. Moreover, the demand for the supply of electrical energy has remained constant with the growth of the chief Mexican commercial centres, and these are numerous. With its abundant water-power, Mexico should enjoy a long period of industrial success.

Amounting at first almost to a monopoly, granted under the ægis of the Diaz Government, Mexican electric light and power utilities have not been seriously interfered with by its successors. Endowed with sufficient reserves to undertake such costly enterprises, any capitalist or body of financiers would now receive equal encouragement. The equitable attitude of the authorities in granting moderate rate increases, together with the decrease in operating costs, have put existing working companies upon a sounder footing, and have greatly improved the value of their properties.

The Callés Administration, while retaining the power, set out in the original concessions, to supervise rates, prescribe uniform systems of keeping accounts, direct any new financing deemed necessary from time to time, and generally to control electrical undertakings in the country in the public interest, allows ample latitude to the respective managements of such utilities. These, upon their part, continually work for a better service while naturally seeking for a decrease in the cost of producing electricity. They have found that this can be best effected by interconnection of the several large stations by extensive transmission systems.

The Mexican Telephone and Telegraph Company, one of the oldest foreign enterprises formed in Mexico, established more than 37 years ago, has been granted a concession by the Congress of the State of Tamaulipas to install an automatic telephone system in the city and port of Tampico, which is also the capital of that State. The company, which already possesses 32,000 miles of line, distributed over ten different States of Mexico, is enabled by the terms of the new concession to take over several small independent lines—mostly at present unremunerative—and to connect them up with its existing lines. The company gained its present valuable concession in the face of very severe competition. Its nearest and most powerful rival is the Swedish-owned Ericsson Telephone Company (Telefonktiebolaget L. M. Ericsson), which has already gained a strong footing in Southern Italy, and is endeavouring to secure and maintain equal influence in Mexico and other Latin-American States.

The Government of the State of Coahuíla has granted a Torreón firm, Messrs. Figueróa y de la Mora, a concession to construct and operate a telephone system in that important commercial and mining city, with a monopoly for twenty years. The company, at the same time, is authorised to extend its lines to any part of the State that it chooses. Exchanges will be constructed at Torreón, Matamóros and San Pédro, in the State of Coahuíla, and at Gomez Palacio and Lerda, in the adjoining State of Durango. Underground cables will be laid in the business district of Torreón, and between 800 and 1,000 telephones of the latest approved type will be installed. With the exception of the necessary poles, which will be supplied locally, the concessionary company will purchase the whole of its equipment abroad. Notwithstanding the advantageous proximity of the United States, British manufacturers should become interested, and those desirous of competing should communicate (either in Spanish or English) with Messrs. Figueróa y de la Mora, Callé Valdez Carillo, Torreón, State of Coahuíla, Mexico.

In the Province of Chihuahua there is under consideration a concession for the construction of a large irrigation and hydro-electric project. An expenditure of 20,000,000 pesos (about £2,000,000) is involved in the scheme, and it is proposed that, besides providing irrigation for 200,000 hectares (approximately 500,000 acres) of new land, the undertaking will furnish electric power in the neighbourhood.

The town of Comayagula, virtually a suburb of Tegucigalpa (Mexico), has decided upon establishing an electricity supply. Inasmuch, however, as the total population to be provided for does not exceed 10,000, the installation would be but a small one.

For many years past the Conchos River has been regarded as a possible source of electric power. After passing Presideo del Norte (Ojinaga), this river and other tributaries supply the Rio Grande with water, thus enlarging its stream and rendering it especially suitable for commercial exploitation. At length, after several years' negotiations, the Government has consented to the employment of the river's waters for a hydro-electric generating plant, and has granted a concession to an electric power company which already commands practically the largest of the water-power installations of the country. The new contract supersedes three others granted at various periods, and will date back from 1909. The terms of the contract call for the construction of a dam 70 metres in height, capable of impounding the waters of the Conchos River to the extent of 1,000 million cubic metres. There will also be a second dam of smaller dimensions, as well as some highly-important hydro-electric works to utilise water for power up to 50,000 litres per second as a maximum.

There are now four radio broadcasting stations of considerable size in the Republic of Mexico, in addition to six of smaller dimensions. Government licence, regulation and inspection are necessary for all receiving as well as transmitting stations. It is estimated that there are 20,000 sets in the capital alone, while 12,000 others are distributed about the country. Ninety-five per cent. of the whole supply has been received from the United States, since British manufacturers, following the disruption of political relations with Mexico, have troubled little to maintain the small amount of electrical trade that they formerly held. Perhaps now that friendly relations have been resumed—the probable effects of which must not be exaggerated from a trading point of view, however—renewed efforts to furnish radio, among other electrical supplies, from the United Kingdom will be made.

The Designer and Initiative.

By W. ROLAND NEEDHAM,

It is the claim of many that they do not get their chance. In some cases, at all events, this is rather an excuse than anything really valid. There is rightly an opportunism which is not compromise; it is the legitimate expression of initiative, being the opportunism of those who see clearly and act promptly. Keenness of vision and spontaneity of action are doubtless to a certain extent instinctive and intuitive, but they are trained faculties also. The man of initiative seems to make opportunities. This is largely an illusion. What he really does is to seize what offers as soon as ever it does offer; and he acts decisively.

Alertness, foresight, and longsight, determination, and concentration of purpose are all just normal characteristics of the man who keeps eyes keen, brain active, and will straining at the leash. Intuition is not all. Ideas are not all. This kind of genius reveals itself where the intuition is guided rightly, and the idea is turned to useful practical account.

It is not only in industry, nor in any one direction, that scope and opportunity exist for men of insight and action to make good. In all directions, and in every branch of industry, the rule obtains.

Great opportunities exist now, no less in engineering than in other industries. They pertain to each separate branch of engineering. The great essentials are these: (*a*) Wide-awakeness; (*b*) the knowledge which can appreciate a need and appraise a remedy; (*c*) concentration of mind, and the self-control this occasions; and (*d*) the ability to give form and content and a body to the offspring of the mind. One must be prepared on occasion to cut right across one's habits of comfort and love of ease; be willing, even eager, to descend from the airy realm of ideas to the humdrum world of actualities; be all out to produce something really workable and which will work well, and be a commercial proposition. Thought is necessary equally with action. One must be able to make up one's mind at the right time, and have the grit to carry the thing through.

It is never well, except under special circumstances, to show one's hand too soon. Extreme care should be taken not to inform the wrong party. If he be convinced that his idea or scheme is sound and valuable, a man should remember that his idea may be stolen, his scheme wrecked, if he entrust it to the hands of a time-serving intermediary. A note to the chief, outlining what the scheme is expected to do (not so much what it is), and asking for an interview, will in many cases ensure a fair hearing.

A caution is often necessary to such persons as are naturally of an impetuous and over-optimistic disposition. They should proceed carefully and thoughtfully. In their case it may well be good to curb the inclination to act impulsively. This is by no means contradictory to the injunction already insisted upon. A man must be able to act promptly at the right time. The psychological moment at times depends more upon the man than even upon the occasion. The over-cautious may need encouragement; often the ultra-confident man is all the better by reason of a little wholesome restraint. A creature of impulse must temper his nervous energy with that knowledge which is principally of himself.

"Fools rush in where angels fear to tread."

Men of real initiative, however, first face their problems fairly and squarely. They then seek a reasonable solution, and with great care satisfy themselves that it is at once workable, reasonable, and economical. After that they act. But there is no mistake about the quality of their action: it is decisive.

There is another essential characteristic which it is well to mention. A man must be prepared not only to act, but, where necessary, to act alone. He may seek advice; unless, indeed, he be the veriest fool, he will. But he never needs a prop. He should be most careful in his selection of friends and advisers, choosing men whose honour is irreproachable as their judgment is sound. He will be able to scrutinise his ideas in the light of their criticism. A true friend is a fearless but constructive critic; and his opinion is always well worth while. None can afford to stand severely aloof, least of all the proud sensitive man. All are the better for sincere, disinterested criticism. The real mark (perhaps that most distinctive of all) of the man of initiative is that, having probed the matter bone deep, having compared and, where necessary, corrected his own ideas by reference to the views of others equally competent, he then carries on, if needs must, single-handed, once the time for action arrives.

It is probably quite impossible to sketch in brief skeleton outline a process involved which shall be applicable to all cases. In general and fairly elastic terms, however, the cycle of events may not greatly depart from the hypothetical procedure suggested below.

A man goes about his daily work attentive to the demands of his own immediate task. If he be at all a keen man, and not off his beat, then he will think in terms not merely of his own bit, but he will seek to understand something of how his bit is related to that of his neighbour, and also how their joint contributions affect the entire product. Specially will he cultivate his powers of observation, strengthen his faculty for reflection and deduction. He will notice how the activities of one man dovetail into those of another, how inter-dependent are the various departments. Time and his own watchfulness will make him sensitive to defects, responsive to needs. Once he becomes conscious of either the one or the other, he will concentrate upon that. Half-an-hour's serious thought in his leisure time will often be sufficient to confirm him in his original opinion or to rebut it. Then he will apply himself to the remedy. He will examine most carefully the existing framework, as it were. Possibly only a faulty member needs replacing by one which will function effectively. At times it may be a radical change of design offers the most promising solution. As, however, he may well expect powerful opposition to too drastic a change, he will also explore the possibilities which offer by way of lesser innovations which possibly have more reasonable chances of survival. Thus he may devise two schemes.

Scheme A, which will improve matters, and be worth while, occasions the least interference with existing arrangements. It is conservative and relegates as little as ever possible to the scrap-heap. Scheme B, whose initial cost will be considerably greater than that of Scheme A, is practically an all-new design. The final results, however, are estimated to justify its adoption even by comparison with the alternative suggestion.

Then he will doubtless approach competent men whom he can trust and whose opinions are valuable. He will recall that adverse criticism, if kindly offered, is often of the utmost service. He will most probably modify his original drafts in virtue of the comments and suggestions so made. He will next think out most carefully how best to secure that his proposals are given a reasonable and impartial hearing. He should know the type of men in charge, and will approach the one whose sympathies and interests are all out for efficiency. He will carefully study his men, and seek not to transgress the canons of good taste and prudence. If the scheme be of that order of things he will probably already have taken the precaution of having it protected. He must expect that, unless he have himself prepared models, the management may suspend judgment until these are in hand.

Should his own employers prove unsympathetic, their competitors may be ready to negotiate. He will, of course, if he be wise, go over the various points again to satisfy himself that things are really as he wishes them to be. In that case, one rebuff need not place him *hors de combat*.

New Electric Fires.

Designs for the Coming Season.

As with books, of the making of many fires there is no end, and the opening of the heating season heralds the coming of many new designs of electric heating apparatus. As a general rule, the novelty lies not so much in the elements and the methods of distributing their heat as in the metal work in which they are embodied. There are, however, a few fires which depart somewhat from the hitherto accepted lines, as will transpire from the ensuing notes.

The market for electric fires is a growing one, for people are beginning to appreciate the worth of heat, without fumes or fuss, which can be obtained by the mere touch of a switch. In addition, electricity supply authorities are making electric heating possible by instituting special rates, and there is every prospect of continued expansion. Whether a wide variety of patterns is the best way of meeting the demand is perhaps questionable, but for the present we must take things as we find them, and confine our attention to a few examples of fires which are now being put on the market for the first time.

The Arora Co.

Among the fresh models which this firm has produced is the "Victoria" fire which is made with two or three 750-W bars. The three-bar pattern is illustrated in fig. 1. It has a handle for carrying purposes and two rotary switches, and is produced in three finishes—matt black, oxidised copper, or bright silvery white. The last finish is obtained by the provision of a non-corrosive metal in place of the more usual polished steel. The "Reflex" fire, shown in fig. 2, is another new design. This is constructed of sheet metal, with a bright silvery white finish, and wrought iron, and is said to give perfect reflected heat and direct radiant heat. It is 12-in. square in plan and has a height of 23 in. There are two 750-kW fire bars which are independently controlled. This fire is also made in a 3-bar pattern.

May & Padmore, Ltd.

Fig. 3 illustrates the "No. 10009" fire which is being made by the above company. It is of simple design with an antique brass front, embellished with a key pattern, and a hammered copper reflector. The company's standard 1,000-W fire bar is fitted. The fire only weighs 5 lb. and is 16 in. high, 11¼ in. wide, and 6 in. from back to front.

Electric Fires, Ltd.

The new patterns introduced by this company are principally developments of its "Electricoal" design, which, as will be inferred, employs imitation coal to obtain the psychological effect of the domestic hearth. The one illustrated in fig. 4 is modelled as a brazier with two fire-bars fitted in the front. To obtain the maximum effect the switches are put in an unobtrusive position. The loading can be either 2 or 3 kW as desired. The body has a black satin finish while the front and mouldings are brightly polished. Another example (fig. 5) has the "coal" arranged in the front, while the heating elements (1 or 2 kW) are fitted in the top at the base of a curved repoussé polished brass reflector. The elements are of the "plug-in" type, and the fire is obtainable in five different finishes.

Credenda Conduits Co., Ltd.

Among the new "Creda" electric fires are the "Wellwin" and "Unique" patterns. The former (fig. 6) is a handsome design, although utility has been the first consideration. It is intended to fill the space formerly occupied by a coal grate. There are three 1-kW elements and the switching arrangement enables one, two or three bars to be used as required.

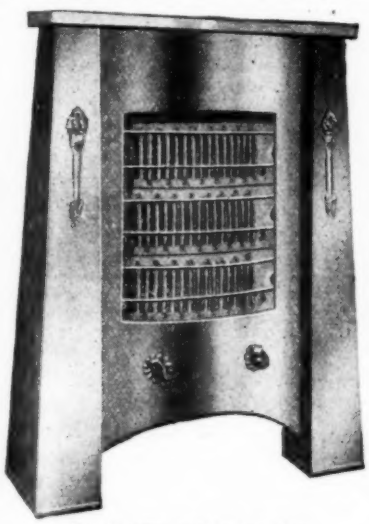


Fig. 1.—The "Victoria" Fire.

Fig. 2.—The "Reflex" Fire.

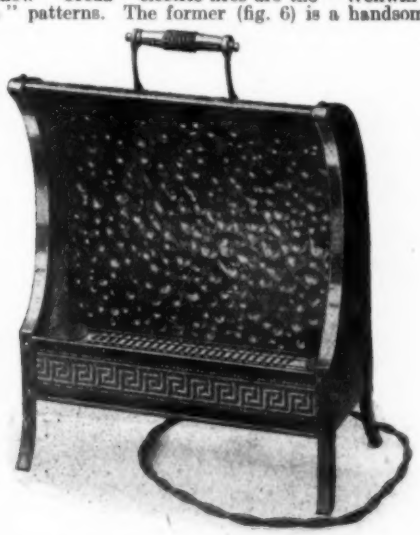


Fig. 3.—The "Maymore" Reflector Fire.

Fig. 4.—A "Heatrae Electricoal" Fire.

Fig. 5.—The "Electriglow" Fire.

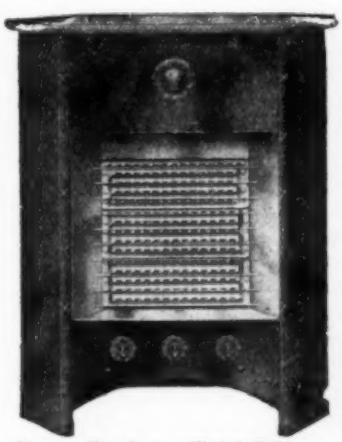


Fig. 6.—The Creda "Wellwin" Fire.

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The body has a polished black finish and the fire bars are mounted in a polished copper "well" which reflects heat which would otherwise be absorbed by the body. The fire is 27½ in. high, 22½ in. wide, and 6 in. "deep"; it weighs 22 lb.

Fig. 7.—The Creda "Unique" Fire.

The other type, the "Unique" (fig. 7), seems to deserve its name. The heating element is in a concealed position at the top of the fire and the heat is reflected downwards on to a polished copper back giving a very fine effect. The flat top makes the fire suitable for keeping food, &c., warm. The loading of the elements is 2 kW in two equal sections. The fire has a weight of 27 lb. and a height of 16 in. Two kinds of finish are provided.

L. G. Hawkins & Co., Ltd.

This company has produced the "Blazor" fire (fig. 8) for the season. This is another example of the imitation coal pattern and it is combined with a reflector back of polished copper. The total loading is 2,250 W, but this is switched in two sections. The body is of heavy cast metal and is given an antique brass, oxidised copper, or polished aluminium finish. Its height is 21½ in. and its width 18½ in.

The Hotpoint Electric Appliance Co., Ltd.

Several fresh designs are being produced by this company, one of them being a handsome Adam model (fig. 9). This is fitted with three 1-kW "knife-edged" refractory heating elements which are controlled by two foot-operated switches at the front of the fire. The body is of sheet metal and can be produced in any one of four finishes—electro-bronze, rustless steel, copper, or brass. Another fire by this firm is the "No. 160" pattern illustrated in fig. 10. This is primarily designed to fit into an existing fireplace. So far as the elements and their control are concerned the fire is very similar to the foregoing model. The usual finish is black, but any of the company's standard porcelain finishes can be executed. A smaller pattern of this type with only two fire bars is also manufactured.

Carron Company.

Fig. 11 depicts one of the latest of this company's designs, the "No. 256" fire. It is provided with two 1,000-W fire bars with well distributed wire elements. One or two bars can be switched on as required. The fire is 14 in. wide and 15½ in. high, and is supplied in four finishes, *viz.*, art black, armour bright, porcelain enamelled, and electro-bronze.

General Electric Co., Ltd.

Several new types have been added to the comprehensive range of "Magnet" electric fires produced by this company for the current season. A form of electric heater which is greatly increasing in public favour is the pedestal type, of which an illustration appears in fig. 12. It is a light pattern with black japan finish and a polished copper reflector. It is fitted with a special canting device, by means of which the reflector can be tilted and fixed at almost any angle, and the heat accordingly directed to any required position.

An entirely new pattern of radiator fire has also been produced. This fire (fig. 13) is constructed of polished brass and copper, and fitted with three helix elements, situated at the base. The control switch enables the heat to be regulated, and the design of the reflecting back plate ensures that the maximum heat is thrown forward.

Another model has an iron body with new-pattern grid elements vertically fixed. It is not only supplied in black matt finish, but also in oxidised copper or oxidised silver. Various period designs, Adam, Sheraton, &c., are also included in the new range of "Magnet" heaters.

(To be continued.)

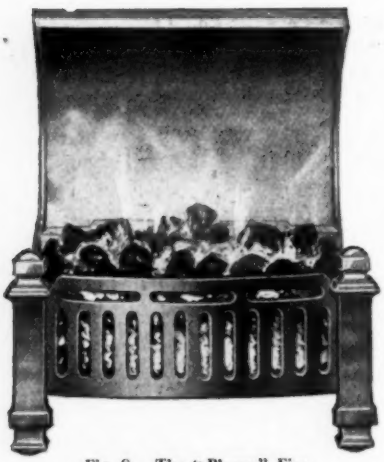


Fig. 8.—The "Blazor" Fire.

Fig. 9.—A Hotpoint "Adam" Fire.

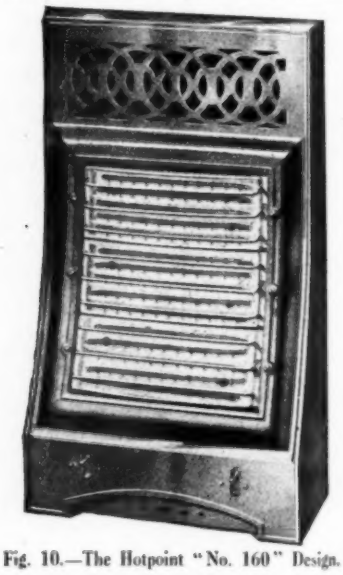


Fig. 10.—The Hotpoint "No. 160" Design.

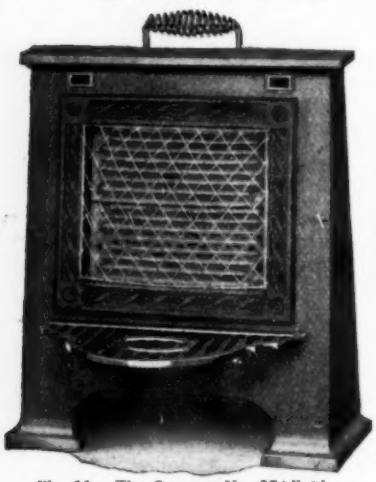


Fig. 11.—The Carron "No. 256" Fire.

Fig. 12.—The G.E.C. Pedestal Fire.

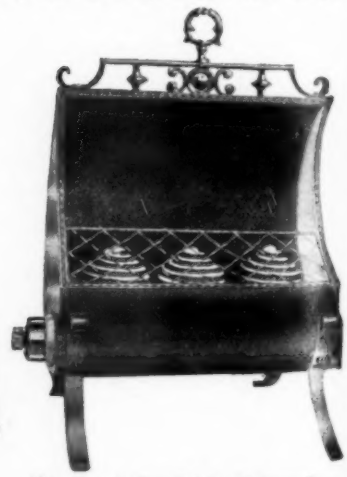


Fig. 13.—A New G.E.C. Reflector Fire.

Japanese Notes.

Electrification of the Central Railway.—The opinion is said to be gaining ground among the railway authorities that it would be more advantageous to electrify the Central Line instead of the Numadnu-Akashi section of the Tokaido Line, and this is likely to be realised. It was originally intended to completely electrify the Tokaido Line by the end of the fiscal year 1928-1929, to coincide with the completion of the Tanna Tunnel on the Atami Line, but the work of building of the tunnel has not made very satisfactory progress, and it is not expected to be completed as previously arranged. The opinion is held that electrification will be more effective on the Central Line, which has many steep gradients, than on the Tokaido Line, which is comparatively level. Moreover, on the Central Line coal is expensive and hard to obtain. It is proposed to take power from the Shinanogawa hydro-electric station.

Decline of Japanese Electrical Production.—The electric power industry having made marked development, foreign electrical machinery and apparatus have been imported in increased quantities, while their production in Japan has decreased and amounted only to 19,000,000 yen in 1923, as against 35,000,000 yen in 1912 and 20,000,000 yen in 1921. In view of this the Japanese Electrical Association is making exhaustive investigations into the possibilities of encouraging and reviving the industry.

The increase in the imports of foreign electrical machinery and apparatus is said to be due to technical progress and commercial activity, and the question of home production and the buyers' purchasing policies are likely to keep up a severe competition between the foreign and Japanese products and between the foreign products themselves. Of the foreign manufacturers, who are most extensively interested in the competition, we may mention Messrs. Mitsui & Co., agents for the General Electric Co. (America) and Messrs. Takata and Co., agents for the Westinghouse International Co., the latter, under new management, being practically as active as its predecessor. Messrs. Suzuki & Co. have lately entered the field as agents for the Metropolitan-Vickers Co., by taking advantage of an increased tendency to adopt steam instead of hydro power plant.

Power Plant Construction.—It is reported that the Kinugawa Hydro-Electric Company is installing an additional 8,000-kW set in its Sumida power station. The work is being pushed forward expeditiously with a view to completing it by March or April next.

The Nippon Denroku K.K. is constructing a hydro-electric power station on the upper part of the Jintsu River, Toyama Prefecture, which will house two 30,000-kVA generators. One of the generators has already been erected.

Electrification of Iron Works.—The electrification of various sections of the Government Yawata Iron Works is making satisfactory progress. The tinplate and flat steel works will be completely equipped with electrical plant shortly. At the same time a 7,500-kW power station will be completed, making the works' total output of power 42,000 kW.

An Electric Railway.—The Takarazuka-Amagasaki Electric Railway Co. was established at the beginning of 1924, with a capital of 3,000,000 yen, by persons interested in the Hanshin Electric Railway Co., for the purpose of laying an electric railway for a distance of 8½ miles from Amagasaki to Takarazuka. The work of construction has not been commenced as official permission for it has not yet been obtained. Efforts are being made by the management to procure that permission.

Electrical Activity in Japan.—In a recent review of Japanese conditions, the United States Commercial Attaché at Tokio stated that inactivity continued in most import lines, the only notable exceptions being electrical equipment and steel products. In the electrical equipment market a considerable amount of business was pending, including substantial orders for generating units, switchgear, and railway motors. British competition was said to be increasing, one company having secured orders for more than 100,000 kW of generator equipment during July.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

Electrical Commercial Travellers.—The Electrical Trades Commercial Travellers' Association is holding its first concert (Bohemian) on Saturday, October 10th, at 7.30 p.m., at the Manchester Hotel, London. The programme of subsequent events for the session has been issued and will be referred to in our next issue.

The Association held a well-attended general meeting on September 4th at the St. Bride's Institute. The chairman (Mr. C. W. Sully) referred to the continued growth and success of the Association and to the fact that already it had been able to give assistance to a member. The treasurer submitted the financial statement and the entertainment secretaries submitted details of fixtures for the winter. The vice-chairman, who had represented the Association at the British Commercial Travellers' Association conference, gave a full and interesting report of this conference to the meeting. The secretary for the newly-formed Employment Register, submitted his scheme for working, and at the same time appealed to all present to assist him in his arduous task by letting him have all the information possible that might be of help to him and the Association in this connection. The vice-chairman strongly recommended the commencement of a Sick Benefit and Thrift Society and offered his personal assistance to anyone forming a local branch. The annual meeting was fixed for November 13th.

New London Municipal Showrooms.—On Thursday next the electricity departments of two Metropolitan boroughs are inaugurating new showrooms and offices.

The Hackney undertaking is opening its new premises in Lower Clapton Road, the Committee having decided not to let labour troubles interfere with the ceremony. An article on these premises by Mr. L. L. Robinson, the borough electrical engineer, was published in our issue of June 13th, 1924 (p. 952). Poplar is the other authority concerned, and in this instance Mr. J. W. Beauchamp, Director of the British Electrical Development Association, is to perform the opening ceremony. The date marks the 25th anniversary of the inception of the undertaking. The new premises are situated in Bow Road.

Oversea Trade Interviews.—Mr. J. H. Henderson, O.B.E., Commercial Counsellor at Rome, will shortly be visiting this country and will attend at the Department of Overseas Trade, 39, Old Queen Street, S.W.1, from October 12th to 16th. Mr. H. A. N. Bluett, Commercial Agent at Batavia, will also attend at the Department from October 5th to 16th. United Kingdom manufacturers or traders desirous of meeting these gentlemen will be able to arrange appointments by communicating with the Comptroller-General of the Department, quoting, respectively, the references 5935 T.G. and 5943 T.G.

Wiremen's Strike at Hackney.—On September 23rd the wiremen employed by the Hackney Electricity Department in the wiring of its new showrooms and offices ceased work owing, it is stated, to the employment of a jointer who was not a member of the Electrical Trades Union. An endeavour was made to involve the whole of the electricians in the Sales Department, but this was unsuccessful. Notices have been tendered stating that the whole of the E.T.U. members employed in the generating, distribution and maintenance departments of the undertaking will cease work this afternoon (Friday), at 3 o'clock. Emergency action is being taken to keep the station running, but it is feared that a strike may delay the completion of the new premises.

E.D.A. Conferences.—The first of the conferences organised by the British Electrical Development Association for the 1925-26 Session takes place on Thursday, October 15th, at 7.30 p.m., at the E.L.M.A. Lighting Service Bureau. Mr. W. E. Bush will deliver an address on "Modern Lighting," and Mr. C. W. Sully will preside. As the accommodation is limited and the subject is a popular one, it is intended to hold a second session on the following night, when Mr. Bush will repeat his address, with Sir Hugo Hirst, Bart., in the chair. We shall publish particulars of the complete programme of the session in our next issue, but it is important that our readers should note that for the events of October 15th and October 16th they must make personal application for tickets, stating on which of these two dates they desire to use them. Letters should be sent to the Association at 15, Savoy Street, Strand, W.C.2.

Road Transport Lectures.—A course of twelve lectures on various phases of modern road transport operation is to be given at the London School of Economics and Political Science, in co-operation with the Institute of Transport. The lectures will be delivered by well-known members of the transport industry on Wednesday evenings, commencing on October 28th.

Unemployment.—A further decrease in the number of unemployed was shown by the Employment Exchange registers on September 14th, the total at that date being 1,327,700, as compared with 1,345,455 a week earlier and 1,163,950 on September 15th, 1924. The Ministry of Labour is inaugurating an experimental scheme for the training of unemployed young men in various trades. Four centres are to be established.

Award for Petter Oil Engines.—MESSRS. PETTERS, LTD., of Yeovil, have received a communication from their Portuguese agents, Fabricas Vulcano e Collares Carlos Alfredo da Silva, Ltd., of Lisbon, that at the recent Caldas da Rainha Exhibition another gold medal was awarded to the "Petter" oil engine exhibit.

E.L.M.A. Illumination Design Course.—The Electric Lamp Manufacturers' Association has decided to hold its seventh illumination design course towards the end of the current month. The course, which is intended for contractors and wholesalers, will commence on October 27th and run for four days. As far as time permits, the course will cover the whole field of electric lighting from the making of lamps to the latest devices employed in the art of illumination.

Municipal Trading.—The subject of municipal retail selling was discussed on Monday this week at a meeting of the Council of the Birmingham Chamber of Commerce. The Retail Section Committee, in a report, recalled the action that the Chamber took some years ago to oppose the sale of electrical fittings by the Birmingham Electric Supply Department, with a successful result. In the last eighteen months the Corporation had opened a new showroom in Paradise Street for the sale of electrical fittings of all kinds. In response to representations made by the Electrical Contractors' Association, the Department agreed to allow its members a considerable discount on any sale, introduced by them, or on fittings fixed by them which had been bought direct by the consumer, and the Retail Section, many of whose members stocked portable apparatus, such as vacuum cleaners, electric fires, lamp shades, electric irons, &c., asked that they should not be subject to this competition by the Corporation, where it could be shown that they were *bona-fide* dealers in the articles stocked, unless at least they had the same allowance on introduction of customers as that enjoyed by the electrical contractors. Such a system was already in operation in other towns, and with rent and rates so high, the Retail Section contended that the municipality should not enter further into trading, but should confine its attention to furthering the supply of electricity. The Retail Section expressed regret that representations which it had made to the Department with a view to fair treatment for all classes of traders had been ignored. It asked the Chamber to help it to get the matter further considered. It was decided to give this support.

Social Event.—On September 12th, the whole of the employés of the Loughborough Corporation electricity works were present at a social evening which was held at the Great Central Hotel. The Mayor and other members of the Corporation were present, and an excellent entertainment was provided. A vote of thanks was accorded to Mr. R. B. Leach, the borough electrical engineer, for arranging the function.

Trade Announcements.—Messrs. W. & T. Lock, of Bath, who were the manufacturers of cabinets distributed by Messrs. Henry Joseph & Co., Ltd., now in liquidation, inform us that they are continuing the production of these cabinets under their own name. Mr. Henry Joseph has been retained as representative for London and the Southern and Eastern Counties, and he will have offices and showrooms at 96, Victoria Street, London, S.W.1.

The Autocar Electrical Equipment Co., of Mitchell Street, London, E.C., has been appointed service agent and depôt for spare parts and repairs to E.A. electric horns and windscreen wipers.

Mr. H. E. Mayhew, 5, Billiter Buildings, Billiter Street, London, E.C.3, has been appointed sole agent in the London district for Sir William Arrol & Co. (Swansea), Ltd., who manufacture structural steel work of all descriptions at Swansea.

Mr. Albert Illing has been appointed manager of the business of C. A. Vandervell & Co., Ltd., in Yorkshire, Cheshire and Lancashire. A C.A.V. depôt is shortly to be established in Manchester.

Messrs. W. G. Perry & Co., Ltd., have moved to 13, Whitcomb Street, Pall Mall East, W.C.2. Telephone: "Regent 1426."

Messrs. B. & G. G. Bell have commenced business in Lowther Street, Whitehaven, as electrical engineers.

Catalogues and Lists.—The Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester.—Descriptive Leaflet No. 71/8-1, dealing with liquid controllers with an automatic acceleration device for a.c. slip-ring motors.

Swedish General Electric, Ltd., 5, Chancery Lane, W.C.2.—Two illustrated pamphlets describing refrigerating plant made by the Century Electric Co. (United States).

The Kango Co., Ltd., 78, Petty France, Westminster, S.W.1.—An illustrated pamphlet describing the "Kango" electro-mechanical hammer.

Engineering and Lighting Equipment Co., Ltd., Sphere Works, St. Albans.—Two illustrated and priced folders advertising "Interzone" reflectors for shop-window lighting, and "Lunax" lighting units.

Messrs. Bruce Peebles & Co., Ltd., Edinburgh.—A reprint from the Electrical Review, dealing with the conversion of the Eskbank carpet mills of Messrs. Stewart Bros., to electric drive.

Autoveyors, Ltd., 82-84, Victoria Street, S.W.1.—A series of pamphlets dealing with "Clix" connectors, "Radio Condit," spiral and bridge condensers, &c.; illustrated and priced. Also a cardboard panel for demonstrating "Clix" connectors and "Radio Condit."

Veritys, Ltd., Aston, Birmingham.—Publication No. 988, a priced and illustrated catalogue of "Maxlume" lighting equipment for commercial, industrial and street-lighting applications.

The British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C.2.—Pamphlets dealing with (*a*) "Mazda" electric lamp outfits for decorative purposes; (*b*) the B.T.-H. table-lamp loud speaker; and (*c*) automobile electric lamps. Illustrated and priced.

Messrs. Blackstone & Co., Ltd., Stamford.—Publication No. 374, a booklet containing particulars and illustrations of various types of "Blackstone" oil engines.

Bruntons, Musselburgh, Scotland.—An illustrated booklet describing "Tru-Lay" wire rope and "Tru-Loc" fittings.

Messrs. L. Andrew & Co., 2, Whitworth Street, Deansgate, Manchester.—A priced pamphlet advertising "Wrendal" metal-filament and "Capella" carbon-filament electric lamps.

Mr. E. Rutherford Palmer, 40½, Bristol Street, Birmingham.—A booklet containing illustrated details of "Star of Eve" reflectors for interior and exterior lighting. Priced.

Cryselco, Ltd., Kempston Works, Bedford.—A catalogue and a series of pamphlets dealing with "Cryselco" opal-type lamps; and a brochure containing notes on interior and street lighting.

The General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—Catalogue Section H (3), containing illustrations and descriptions of the company's heavy electric cooking equipment.

W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.—An illustrated and priced pamphlet dealing with "Isco" service cut-outs.

The Constructional Engineering Co., Ltd., Titan Works, Charles Henry Street, Birmingham.—Pamphlet No. 138, containing an illustrated description of the "Titan" steel barrow.

The Chloride Electrical Storage Co., Ltd., Clifton Junction, near Manchester.—A priced and illustrated catalogue of secondary batteries for radio purposes. An appendix sets forth the characteristics of many makes of valves; explains the method of choosing a battery and rheostat, and gives notes on the care of batteries.

The Economic Electric, Ltd., 10, Fitzroy Square, W.1.—An illustrated catalogue of radio apparatus of all kinds.

Pope's Electric Lamp Co., Ltd., 5, Arthur Street, New Oxford Street, W.C.2.—A pamphlet advertising "Elasta" electric lamps.

Bankruptcy Proceedings.—J. E. Wild, Bark Street, Bolton, engineer and wireless merchant.—The public examination of this debtor was held at Bolton Bankruptcy Court, on September 23rd, the statement of affairs showing liabilities of £1,236, and a deficiency of £1,016. The debtor commenced the Bolton business in 1923, and was very successful up to last May. He then took up a new receiving set which was being placed on the market. It went well until the Wireless Telegraphy (Amendment) Bill was introduced. The sales for the week previous to the Bill were £150. In the succeeding weeks they dropped to £20. His overhead expenses for advertising, &c., averaged £28 to £30. The Bill had caused a slump just when he had got his set into the hands of wholesalers. The Deputy Official Receiver said that he could not credit the story that the threat of a Wireless Bill stopped the sale of this set and caused the failure. Wild said it was not the sale of this set only but the sale of most wireless sets which was interfered with. The examination was closed.

F. J. Tizzard and N. Tizzard, 102, West View Road, Barrow, carrying on business at Barrow and Dalton-in-Furness, under the style of Tizzard Brothers, electrical engineers and contractors.—These debtors appeared for their public examination at the Barrow Bankruptcy Court, on September 25th. The gross liabilities were £476, of which £425 was expected to rank, and the deficiency £263. The failure was attributed to the loss on the Dalton shop and a bad season in Barrow. The examination was closed after the debtors had been questioned.

J. G. Penman, electrical engineer and contractor, 37, Bath Street, Glasgow.—A dividend is payable on November 2nd, at the offices of Messrs. Dunlop & Murray, 188, St. Vincent Street, Glasgow.

C. E. F. Parker, electrical engineer, Greendale, Privett Road, Gosport.—First meeting, October 5th, at the Official Receiver's office, 87, High Street, Portsmouth. Public examination, November 2nd, at the Court House, Portsmouth.

P. L. Symonds, electrician, 4, Nelson Road North, and 4, Victoria Road, Great Yarmouth.—Last day for proofs for dividend, October 17th. Trustee, Mr. C. B. L. Prior, Official Receiver, 9, Queen Street Chambers, Norwich.

H. Parr, electrician, 2, Strawberry Dale Square, and 1, Back James Street, Harrogate.—Trustee, Mr. W. A. Thompson, 112, King's Road, Harrogate, released August 19th.

S. L. Babty and N. Miles (Wireless Instrument Manufacturing Co.), wireless instrument manufacturers, Avenue Works, Avenue Road, Willesden Junction, N.W.—Last day for proofs for dividend, October 7th. Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C.

F. P. Crawley, electric, radio and motor-car engineer, 60, Darwen Street, Blackburn.—Last day for proofs for dividend, October 9th. Trustee, Mr. A. T. Eaves, 47, Mosley Street, Manchester.

Company Liquidations.—Robins Wholesale Electrical and Wireless Co., Ltd., Fanny Street, Cardiff.—A further meeting of creditors was held recently. At the statutory first meeting of creditors a statement of affairs was submitted by the liquidator, Mr. S. E. Clutterbuck, 31, Queen Street, Cardiff, disclosing liabilities of £4,261 and net assets of £595, leaving a deficiency as regarded the creditors of £3,666. The issued capital amounted to £999. It appeared that the debenture holder had appointed a receiver, who was in possession of the assets. At the further meeting of creditors it was resolved that the creditors should recommend the continuance of the voluntary liquidation with Mr. Clutterbuck as liquidator, and that he should be instructed to make a close investigation into the whole dealings of the company. It was also decided

that the creditors should be asked to contribute in cash to the costs of the investigation on the basis of 5 per cent. on the amount of the account of each creditor. An advisory committee was also nominated consisting of Messrs. Corfield and Cripwell, Birmingham, Mr. C. J. Neale (Siemens & English Electric Lamp Co., Ltd.), Mr. T. Ridout (General Electric Co., Ltd.), the Marconiphone Co., Ltd., and Messrs. Poppleton & Appleby, of Birmingham.

MILLIGAN'S WIRELESS CO., LTD., Sauchiehall Street, Glasgow.—A meeting of creditors was held recently, when a statement of affairs was submitted which showed liabilities of £2,388, all due to unsecured creditors. The net assets were given as £344, leaving a deficiency of £2,044. The company was incorporated in 1923, with a share capital of £3,525, to take over an existing business. Capital to the extent of £1,000 was subscribed in cash, and the balance was represented by the purchase price of the business, plus £500 goodwill. The company was originally in premises in Renfield Street, but were obliged to remove to their present address, which cost them a considerable sum, and also disorganised their business for a time. The following year a branch was opened in Bath Street, which venture proved disastrous. It appeared that large losses had been incurred every year on bad debts. Loss due to a fire amounted to over £600, but the company had difficulty in proving the loss to the insurance company owing to the absence of a stock book. It was decided to confirm the voluntary liquidation of the company, with Mr. E. S. McFarlane, C.A., 153, St. Vincent Street, Glasgow, as liquidator, while an informal committee was also nominated.

TELE-DIS SERVICES (FOUNDERS' CO)., LTD.—The liquidator, Mr. G. D. Pepys, reports that the liabilities of this company, which was organised to carry on a telephone-disinfecting service, amount to £17,856, and the assets to £94. Thousands of contracts were entered into all over the country. The company's failure is attributed to the heavy advertising expenses, cost of distribution of products, lack of capital, and the general depression in trade.

P.S. WIRELESS MANUFACTURING CO., LTD.—Particulars of claims to be sent by October 31st to the Liquidator, Mr. E. Webb, 34, Grand Parade, Brighton.

Private Arrangements.—S. C. COLEY, trading as the Torbay Electrical and Wireless Co., 23, Victoria Parade, Torquay, wireless and electrical engineer.—The creditors interested herein were called together recently at the offices of Messrs. Ware, Ward & Co., Torquay, when it was stated that the total liabilities were £2,980. The net assets were valued at £310. It was reported that the debtor commenced business in April, 1924. He had no capital, but obtained a guarantor to the bank, and that guarantee was still in existence for the full amount of the bank overdraft. Debtor had from time to time had balance sheets prepared, and on each occasion substantial losses had been shown. The deficiency was accounted for by loss on trade, debtor's drawings, and depreciation. Debtor was not in a position to submit any offer to the creditors, but the gentleman who was the bank guarantor and also a cash creditor consented to discharge the bank overdraft and withdraw his own claim against the estate on condition that the creditors agreed to a deed of assignment. The creditors resolved that, subject to the bank's claim and the cash claim not ranking for dividend, the debtor should be requested to execute a deed of assignment to Mr. Arthur Collins, C.A., Torquay, as trustee, with a committee of inspection.

R. H. WELSH, electrical engineer, Exeter Road, Bootle.—A meeting of creditors was held recently at the office of Mr. J. H. Hort, I.A., Liverpool, when a statement of affairs was presented which showed liabilities of £310, all due to unsecured creditors. The assets were estimated to realise £144, leaving a deficiency of £166. It was reported that the debtor commenced business in October, 1922, with £50 capital, borrowed from his father, of which £40 had since been repaid, and capital of his own amounting to £93. Complete books of account had not been kept, and no details of the turnover were available. It was decided to adjourn the meeting to enable the debtor to approach his father with a view to the latter's making an offer of 10s. in the £ to the creditors. At the resumption of the meeting it was reported that certain moneys had been handed over, and it was now possible to assure the creditors a composition of 10s. in the £, payable as to 5s. in cash and 5s. in three months. The offer was accepted, and the deed of assignment already executed in favour of Mr. J. H. Hort, 24, St. Thomas Street, Liverpool, was confirmed.

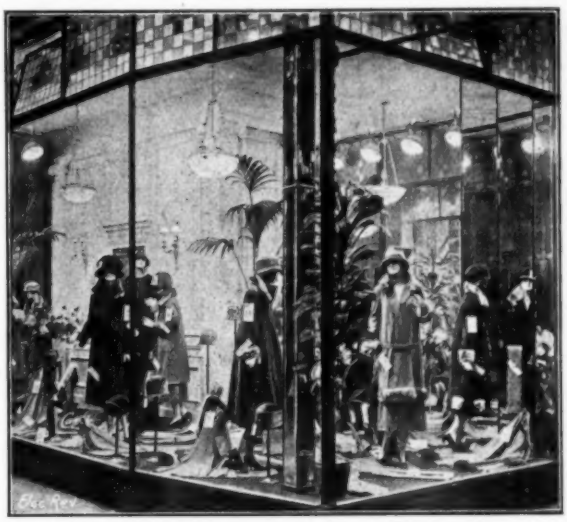
Dissolutions of Partnership.—P. VAUGHAN & Co., electrical engineers, 57, Fetter Lane, E.C.—Mr. S. P. Storey and Mr. W. H. Matthews have dissolved partnership. Mr. Storey will attend to debts and continue the business under the same style.

ROYAL ACCUMULATOR CO.—Mr. W. Johnson and Mr. J. Ingham have dissolved partnership. Mr. Johnson will attend to debts.

North Wilford Power Station.—We are informed that nine "Maxtorq" totally-enclosed squirrel-cage motors, of 25 b.h.p. at 720 r.p.m., were supplied to the Nottingham Corporation by the Lancashire Dynamo & Motor Co., Ltd., to drive the coal crushers; two of them appear in fig. 7, p. 460, of our description of the North Wilford power station. The d.c. machines driving the fans (fig. 6, p. 460) were also supplied by this company, in connection with Messrs. Davidson & Co.

British Manufacturers and Australian Tariffs.—The Sydney (N.S.W.) correspondent of the *Daily Telegraph* states that a recent meeting of the Australian Association of British Manufacturers and representatives directly concerned with the interests of British trade with Australia, passed a resolution stating that, while fully appreciative of the advantages accruing to British trade from the Commonwealth Government's maintenance of the principles of preference in the recent tariff proposals, the high duty on articles affecting the textile and engineering trades proved a serious blow to British trade in general with Australia. The Association felt that the increased tariff on British goods would prove an obstacle to further inter-Imperial relationships. It suggested that consideration should be given to the question whether relief could be granted to British trade.

A New Phase in Show-window Illumination.—The modern shopkeeper has long realised that good window lighting is a most effective form of advertising, and for some time past the managements of well-known shops and stores have adopted higher intensities of light for the illumination of their show windows. It may be said, however, in this direction that Messrs. Canda, Ltd., of Oxford Street, have created a precedent in show-window illumination. The illustration herewith is from a photograph of a window in their new Oxford Street emporium, taken by the window lighting alone, at midnight. The excellent illumination is the result of a system of lighting



The Lighting of an Oxford Street Show Window.

combining "Gecoray" reflectors and 500-watt bowl-sprayed white "Osram" gasfilled lamps. It is claimed that this is the first time in the history of illumination in this country that 500-watt gasfilled lamps have been used on a large scale for this purpose in individual silvered-glass reflectors. Before the high-wattage lamps were permanently installed in this establishment, exhaustive tests were carried out upon a number of "Gecoray" reflectors, designed to accommodate either 300- or 500-watt gasfilled lamps, with a view to determining whether they would successfully withstand the additional heat generated. The results of the tests proved that the reflector was entirely unaffected by the heat, and that it did not crack, peel, or tarnish.

From the crowds of pedestrians who gather nightly round the windows of Messrs. Canda, Ltd., it is apparent that not only is the beauty of the displays enhanced by the use of the high intensity of light, but that light as "The Silent Salesman" is more than justifying itself. It should be particularly noticed that shadows are totally eliminated. The consulting engineers in connection with the work were Messrs. Albion T. Snell & Partners, and the electrical work of the whole installation, as well as throughout the interior, showrooms, &c., was carried out by Messrs. Francis Polden & Co., Ltd., who are to be congratulated upon the excellence of their work in connection with this notable achievement.

New Indian Company.—The Shree Bhawani Maratha Mills & Electricity Supply Co. is a combined textile-manufacturing and electricity supply company recently formed at Barsi with a capital of 15,00,000 rupees.

The Salonica International Fair.—This Fair, which was to have been held during the current year, is to be held from May 15th, 1926, for a period of two or three weeks. Applications for space, &c., should be made to the Fair offices, 11, Papakiriazi Street, Salonica, by January 15th next.

Chinese Electrical Notes.—The *Chinese Economic Bulletin* states that the imports of electrical materials and fittings during 1924 were valued at 4.22 million Haikwan taels (£772,000 approx.). The slight decrease from the previous year's figure is considered to be due to the lower prices engendered by competition. Trade in this class of goods is well maintained, although competition is severe. The discontinuance of bulk supplies from the Shanghai municipal power station, during the recent strike, involved the shutting down of 1,425,000 spindles in cotton mills.

The Question of Government Aid for Industry.—The following comments appearing in *The Times* editorial City Notes, and discussing "the industrial perspective" and "Limits to Government Action," are worthy of consideration by all our readers:—"In opening the Motor-cycle Show at Olympia, Sir Burton Chadwick, M.P., Parliamentary Secretary to the Board of Trade, drew a picture of the industrial situation with a better sense of perspective than some of our industrialists are prone to do. He did not deny that there was grave cause for the gloomy forebodings of those engaged in some of our most important unsheltered industries; but the motor-cycle industry was not one of them. The history of that industry since the war was a fine story of enterprise, ingenuity, pluck, and good British workmanship. It had recovered its competitive power in oversea markets, especially in Australia. In 1920, he pointed out, Great Britain exported 21,000 motor-cycles and America 37,600. In 1924 that position was completely reversed: Great Britain exported 37,000 and America 16,800. This showed that the industry, which was fully employed, had by its own efforts worked with such purpose that its product was supreme in the home market, and was rapidly ousting its competitors in the foreign markets. It was not a case of 'muddling through,' but of carefully-thought-out plans, unremitting hard work, and co-operation amongst all concerned. No one will deny that this is the best basis on which to build up the supremacy of any industry. It conforms to Nature's law of the survival of the fittest. When things go badly, many people are apt to clamour that the Government shall do something. All experience goes to show that legislation has done more to hinder trade than to assist it. The main function of Government is to keep law and order, to look after the foreign affairs of the nation, and to administer with the utmost economy the nation's finances. The Government is not in a position to know a business as well as those engaged in it. Consequently, unless there is virtual unanimity as to the merits of a particular legislative project put forward by those engaged in a particular industry, the Government must act warily and with great caution. Even when unanimity is present the Government has to assure itself that by passing legislation with the object of benefiting one industry, it will not be doing more harm in the aggregate to others."

The Metric System in Argentina.—The Argentine Ministry of Agriculture has sent a notice to public auctioneers calling their attention to Article 18 of the regulations supplementing the law governing weights and measures in Argentina. This article provides that "persons who, in private contract, in books or commercial documents, public placards, or advertisements, employ denominations of weights and measures not authorised by the law shall be punished by fine." This article therefore prohibits the use of weights and measures not comprised in the metric system. *Commerce Reports* says that although this notice is addressed to auctioneers, it would seem applicable as well to manufacturers' catalogues. No ruling has yet been published as to the use of other measurements in cases where the metric equivalents are shown, but it is probable that no objection will be made if both units appear.

Threatened Tramway Strike at Salford.—The dispute at Salford regarding the employment of non-unionists in the Tramway Department was settled last week, the remaining man concerned having agreed to join the Transport and General Workers' Union.

Russian Electrical Imports.—A German commercial newspaper states that the imports of electrical goods into Russia during the five months from October, 1924, to February, 1925, were valued at 3,821,000 gold roubles, as compared with 1,936,000 roubles in the equivalent period of 1923-24. Included in this total were dynamos and motors, 756,000 roubles (as against 326,000); electrical appliances, 1,980,000 roubles (783,000 roubles); and incandescent electric lamps, 1,085,000 roubles (827,000 roubles). Germany's share of the total was valued at 2,117,000 roubles, as compared with 1,831,000 roubles.

Local Exhibitions.—Salford.—The exhibitors participating in the Salford Corporation electrical exhibition which concluded on September 24th were:—The British Electric Transformer Co., Ltd.; the British Thomson-Houston Co., Ltd.; the Edison Swan Electric Co., Ltd.; the Jackson Electric Stove Co., Ltd.; the Metropolitan-Vickers Electrical Co., Ltd.; the General Electric Co., Ltd.; the Hotpoint Electric Appliance Co., Ltd.; and Messrs. Ward & Goldstone, Ltd.

A radio exhibition was held at the Philharmonic Hall, Liverpool, last week, concluding on Saturday last. A comprehensive display of radio sets and components was arranged, and the public was permitted, by the courtesy of the B.B.C., to inspect the latest type of microphone used for studio work. The Liverpool Wireless Society explained and demonstrated the actual construction of wireless sets at one stall, and at another were sets made by the members. Altogether there were 26 stalls, in addition to the Wireless Society's workshop. The main trade exhibitors were:—C. Lucas (Hobbies Dept.); Jake Graham; Liverpool Radio Supplies; M. Stanley & Co.; Central Electrical and Radio Co.; F. H. Middleton; F. W. Mason; S. G. Brown, Ltd.; Sefton Electrical Co.; Brown Bros.; the British Radio Manufacturing Co.; Sel-ezi Wireless Supply Co., Ltd.; Walter C. Barraclough; James G. Ivory; John Banks & Sons; John Gaunt; F. D. Phillips; Makerimport Co.; J. D. Wireless Co.; Harding, Holland & Fry, Ltd.; the Silvertown Co.; the Wireless League, Liverpool; Radiovim, Ltd.; and the Gil-Ray Trading Corporation.

Fleetwood.—A successful exhibition of electric cookers and domestic appliances was held at Fleetwood last week. The results were good, orders being booked for 104 cookers, in addition to radiators and grills. It has been decided to arrange another exhibition next autumn.

Leicester.—At the All-Electric Exhibition which is to be held in the Junior Training Halls from October 8th to 17th, there will be a special display of good and bad lighting methods, organised by the Electrical Association for Women. The fittings, we understand, have been arranged in co-operation with Mr. Beauchamp, of E.D.A. and the E.L.M.A. Lighting Service Bureau. On the opening day, Miss F. Hodge, of the E.L.M.A. Bureau, will lecture on "Home Lighting," and during the whole of the following week commencing from Monday, October 12th, Miss Margaret Partridge will give a lecture each afternoon, with demonstrations on the following subjects:—The Live Wire—Mending fuses, &c.; What Electricity can do; Cooking by Electricity; Electric Radiators; and The House Without a Servant. The lectures have been arranged in co-operation with Mr. Smith, the city electrical engineer.

The Shannon Scheme Dispute.—Work has not yet commenced upon the Shannon hydro-electric scheme owing to the refusal of Messrs. Siemens Schuckert, the contractors, to pay the rates of wages demanded by the Irish Transport Workers' Union. The union rate for unskilled labour is 1s. 1d. per hour for a week of 48 hours, whereas the contractors offered 8d. per hour for a 50-hour week. A later offer by the firm provides for a flat rate of 32s. for a 50-hour week, with free quarters, and food at special prices.

New Zealand's Electrical Imports.—In a review of the imports of New Zealand during the first half of the current year, the *Board of Trade Journal* states that while the United Kingdom increased its business in a number of directions, it lost ground considerably to the United States in, *inter alia*, electrical machinery and appliances. The actual figures are not yet available.

British Trade Mark Applications. — The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be lodged within one month from September 23rd.

The Snake (lettering and design). No. 457,000. Class 8. Induction coils for use in radio-telephony and telegraphy.—R. V. Langbart, trading as the London Wireless Co., 3, London Road, Liverpool.

Tangent. No. 458,044. Class 8. Inductance coils, coil holders, rheostats, low-frequency inter-valve and telephone transformers, high-frequency transformers, variable and fixed condensers, thermionic valve holders, grid leak resistances, headphones, primary cells, crystal receivers and parts, all being apparatus or components of apparatus for use in radio-telegraphy and telephony. Pul-Syn-Etic-Electric (lettering and design). No. 460,983. Class 10. Electrical horological instruments.—Gent & Co., Ltd., Leicester.

Narron. No. 458,708. Class 8. Radio-telephonic instruments and apparatus, namely, rectifiers, detectors, condensers, telephones, loud speakers, amplifiers, and electric gas discharge tubes. No. 458,709. Class 13. Electric incandescent lamps and their parts, electric light fittings, lampholders, and reflectors. No. 458,710. Class 16. Glass reflectors and globes.—Osram Gesellschaft, 11-14, Ehrenbergstrasse, Berlin, O.17. (British representatives: Cruikshank & Fairweather, 65-66, Chancery Lane, W.C.2.)

Etherplus (lettering and design). No. 460,173. Class 8. Instruments and apparatus for use in connection with radio-telegraphy and telephony.—M. and A. Wolff, 9-15, Whitecross Street, E.C.1.

Hawk (lettering and design). No. 451,078. Class 8. Radio-telegraphy apparatus.—The Hawk Co., Ltd., St. Mary's Road, Surbiton.

Minstrel. No. 461,388. Class 8. Instruments and apparatus for use in connection with radio-telegraphy and telephony.—S. H. Taylor, 39, Hillmarton Road, Holloway, N.7.

Reltak. No. 461,264. Class 13. Terminals for electric lampholders, lamp sockets, and electric light fittings.—Mycromet Manufacturing Co., Clydesdale Work Street Works, Copsterhill Road, Oldham.

Magiclog. No. 459,486. Class 16. Electric fires.—Berry's Electric Co., Ltd., 85-86, Newman Street, W.1.

For Sale.—Worcester Corporation invites offers for two 95-h.p. Crossley gas engines and suction gas producer plants; Taunton Corporation Electricity Department, owing to change of system of supply, has for disposal surplus generating plant, &c. Messrs. H. Butcher & Co. will sell by auction on October 28th, at the London Auction Mart, Queen Victoria Street, E.C., valuable waterside properties situated at Stratford, E. Hull Corporation Electricity Committee invites offers for surplus generating sets. (See our advertisement pages to-day.)

Irish Free State Electrical Imports.—The imports of electrical goods and apparatus—excluding dynamos, motors, and other electrical machinery—during June last, amounted to £24,308, as compared with £27,126 in the similar month a year ago. The returns for the first six months of the year show a total of only £159,144, as compared with £216,902 in the corresponding half of 1924.

The Swiss Radio Industry.—Steadily increasing interest is being shown in radio-telephony and broadcasting in Switzerland. So far the bulk of the receiving sets in use have been imported but a home wireless industry is gradually being built up. One of the principal Swiss manufacturers is the Société Televox, of Neuchatel, which, in addition to two-, three-, and four-valve sets, is producing transformers and variable condensers. Apparatus under Marconi licences is also being turned out by Favarger & Co., of Neuchatel. The Fabrique Suisse d'Isolants, of Bretonbac, manufactures all classes of enamelled and bare wire and various insulating materials. The Société des Câbleries et Trefileries, at its works at Cossonay, turns out wires and cables from the smallest to the largest size, while the Société Leclanché, of Yverdon, is specialising on primary batteries for dull-emitters, h.p. batteries and condensers, the last being a class of goods which the company has supplied for many years to the Swiss telephone and telegraph authorities. Finally, it may be mentioned that the H. Weidmann Co., of Rapperswil, has a speciality in "Cornite" moulded insulation for valve sockets, &c.

Book Notices.—"The Electrical Contractors' Year Book, 1925-26." (Pp. 376.) London: The Electrical Contractors' Association (Inc.). Price 5s.—Apart from the doubling of the price, there is little change in this issue as compared with that for 1924-25, except in such matters of detail as must always be attended to in annuals of this kind. The legal section has been slightly revised and re-entitled "The Law of a Consumer's Right to the Supply of Electricity."

"Electro-Farming."—We have received copies of the first four issues of "Electro-Farming," a new monthly journal which has been started to deal solely with the application of electricity to agriculture and to rural industries. It is claimed that this is the only journal of the kind in existence, "although nearly a million farms use electricity." The editor is Mr. R. Borlase Matthews, Wh.Ex., whose experience both as an electrical engineer and as a practical farmer, combined with literary ability and enthusiasm for his subject, admirably fits him for the post. The purpose of the journal is "to record progress, to lead to improved methods of construction, and to stimulate the interest of both farmer and engineer in rural electrification." The first issue (dated June, 1925) contains articles on "Haymaking without Sunshine," "Wireless and the Farmer," "Electricity in the Farm Buildings," "Electric Ploughs for Small Fields," &c.; in later issues, in addition to electrical features, articles of general interest to farmers are inserted, and the standard set up in the first issue is more than maintained. Those who know the editor will not be surprised to learn that the decimal system of filing cuttings is described, and provision is made in the journal to facilitate filing, the classification reference number being printed at the head of each article. The journal is issued by Electrical Press, Ltd., price 4d., and should prove of great assistance in furthering the use of electricity in the country.

"High-Voltage Testing Equipments (1,000,000 V)," by E. T. Norris, A.M.I.E.E. (pp. 8; 6 figs.). Hollinwood (Lancs.): Ferranti, Ltd.—This brochure illustrates and describes the method of obtaining test pressures up to a million volts by use of three transformers in cascade. The construction of the transformers is detailed, and illustrations are given of million-volt arcs and discharges.

"Science Abstracts" (A and B). Vol. XXVIII. Part 9. September 25th, 1925. London: E. & F. N. Spon, Ltd. Price 3s. each.

"High-Tension Line Practice," by E. V. Pannell. Pp. xv+277; 124 figs. Price 22s. 6d. net. "The Principles of Sound Signalling," by M. D. Hart and W. W. Smith. Pp. 139; figs. 12. Price 12s. 6d. net. London: Constable & Co., Ltd.

"*Journal* of the American Institute of Electrical Engineers." Vol. XLIV. No. 9. September, 1925. New York: The Institute. $1.

"The Elements of Internal-Combustion Engineering," by T. Petrie. Pp. xi+236; figs. 61. Price 10s. 6d. net. "Photo-Electricity," by H. S. Allen. Pp. vi+320; figs. 43. Price 18s. net. London: Longmans, Green & Co., Ltd.

"Wireless Questions and Answers," by P. J. Risdon. Pp. 92. London: W. Foulsham & Co., Ltd. Price 1s. net.

Lead.—Reporting on September 26th, Messrs. James Forster & Co. stated:—"The general position is unchanged. There is still an acute shortage of prompt lead, which threatens to become worse next month, when the full effect of the shipping strike in Australia and South Africa is felt. The future of the market is difficult to read, as it is impossible to say what effect the settlement of the strike will have on prices. Although consumption is still large, particularly in the electrical trades, there is an indication that the home trade is not so busy. Consumption in Germany also is falling off, while in America the position is easier and forward lead is on offer. We still think that consumers should adopt a precautionary attitude, as a backwardation of over £3 a ton can hardly be regarded as healthy."

Electric Steel Production in Brazil.—The electrometallurgical works at Libeirao Preto (Sao Paulo) are nearing completion. The necessary electric power will be supplied by a hydro-electric works at Rio Mojos. The works will have a production of 60 tons of steel per day.

New Swiss Company.—A new company has lately been organised in Berne with the title Die Bern Radiogenossenschaft, to establish a new broadcasting station in that city.

Lighting and Power Notes.

Adwick.—ELECTRICITY SCHEME PROGRESS.—Under the Council's electricity scheme now nearing completion, a bulk supply will be taken from the Brodsworth and Bullcroft colliery companies. The Council's charge for lighting will be 5d. per kWh. A charge applicable specially to tenants of houses belonging to the colliery companies and to the Council will be made at the rate of 1s. 6d. per week for five points and 1s. 7½d. for seven points.

Australia.—VICTORIA.—Construction work on the transmission line from Melbourne to the Sugarloaf-Rubicon hydro-electric project of the Victorian State Electricity Commission is nearing completion. Until the hydro-electric works are completed, the line will be used for supplying electricity from Yallourn to the towns in the North-Eastern district of Victoria. Tenders will shortly be invited for the supply of plant for the hydro-electric project, and within two months it is expected that further tenders will be called for the construction of the water-races, pipe lines, and other works. The Sugarloaf-Rubicon scheme provides for the installation of generating plant with a total capacity of 40,100 h.p. The plant will be installed in the following six power houses:—Sugarloaf, 18,000 h.p.; Snobs Creek, 5,100 h.p.; Lower Rubicon, 3,600 h.p.; Rubicon, 12,000 h.p.; and two smaller ones at Royston and Rubicon Falls. The combined power houses will supply all the towns in the North and North-Eastern parts of Victoria and some of the New South Wales border towns.—*Reuter's Trade Service* (Melbourne).

Aylesbury.—LOANS SANCTIONED.—The Town Council has received sanction to a loan of £2,200 for converting plant in connection with the supply of electricity to the works of Hazell, Watson & Viney, Ltd., and also to £6,000 for the purchase of domestic apparatus to be let on hire.

Blackburn.—YEAR'S WORKING.—We have received from Mr. P. P. Wheelwright, borough electrical engineer, a copy of his report, together with the statement of accounts, for the year ended March 31st last. The total income amounted to £162,283, and working expenses were £72,247, leaving a gross profit of £90,036, to which was added a grant from the Unemployment Grants Committee of £254, and the proceeds from the sale of old machinery of £1,370, making a total of £91,660. The previous year's figures were: Income, £152,166; working expenses, £69,223; gross profit, £82,943. The power of capitalisation of interest and suspension of sinking fund expired during the year, and consequently the full interest and sinking fund charges had to be borne. These amounted to £61,546 and £51,085 respectively, which, together with other charges, totalled £119,757, thus leaving a net deficit of £28,096. The capital expenditure during the year amounted to £124,592, the chief item being £75,698 for mains and distributing plant. The electrical energy sold increased from 17,237,626 to 21,843,041 kWh, and the maximum supply demanded from 10,170 to 12,496 kW. The average price per kWh obtained fell from 2.07d. to 1.74d. Work was commenced during the year on the laying of a transmission line between the Corporation electricity works and the Preston station.

Bradford.—STREET LIGHTING.—The street-lighting tests now being carried out for purposes of comparison between electricity and gas involve, so far as the Electricity Department is concerned, 300-watt gasfilled lamps suspended from tramway standards designed for use on main roads, lamps of 500-watt capacity for the city centre, and lamps of 200 watts for the suburban streets.

Brighton.—LOANS.—The Town Council has received sanction to a loan of £3,890 for the provision of a new switchboard at the North Road sub-station, and is applying for a further loan of £4,050 for mains and services in the Portslade area.

MAINS EXTENSIONS.—The Electricity Committee is to carry out extensions to mains at an estimated cost of £4,200.

Builth Wells.—INAUGURATION OF SUPPLY.—The power station owned by the Builth Wells Electric Supply Co., Ltd., was formally inaugurated on September 19th. The plant consists of a 40-kW d.c. generator supplied by the Electric Construction Co., Ltd., driven by a 70-h.p. semi-Diesel engine by Messrs. Ruston & Hornsby, Ltd., and a 125-cell, 600-amp. battery supplied by Messrs. Pritchett & Gold & E.P.S. Co., Ltd. The switchboard was supplied by the Austin Lighting Co., Ltd., the overhead cables by Messrs. W. T. Henley's Telegraph Works Co., Ltd., and the insulators, &c., by Messrs. Bullers, Ltd. The resident engineer is Mr. J. B. Colbran.

Caterham.—PRICE REDUCTIONS.—The Urban Electric Supply Co., Ltd., announces that from October 1st the price of electricity for lighting will be reduced from 1s. per kWh to 10d. per kWh, subject to minimum charges of 12s. 6d. for the winter quarters and 8s. 4d. for the summer quarters.

Cheadle and Gatley.—LOANS.—The Urban District Council has applied for sanction to loans of £6,286, £500, and £3,670, for extending its electricity supply to Adswood, High Grove Road, Gatley, and Styal Road. The electrical engineer has been asked to report on the advisability of applying for a Special Order to supply certain parts of Northern Etchells.

Continental.—SPAIN.—The Sociedad Canalizacion y Fuerzas del Guadalquivir, which was formed in Madrid last year, has secured a concession to utilise the water power of the River Guadalquivir at eleven different points between Cordoba and Seville and is to construct a hydro-electric power station with an annual output of 34 million kWh. The distribution of the power will be undertaken by the Compania Sevillana de Electricidad and the Sociedad Hidro-electrica de Chorra.

SWITZERLAND.—The Société des Usines Electriques d'Olten-Aarburg recently decided to modernise its hydro-electric power station at Ruppoldingen on the Aar which has been in operation since 1896 and to change over the system of supply from two-phase, 40 cycles, to three-phase, 50 cycles. The old plant comprised ten Jonval-type axial turbines, developing 300 h.p., at 28.5 r.p.m. The contract for the work was given to the Société Motor Columbus, of Baden, for the electrical equipment and with the Société des Ateliers des Charmilles, of

Geneva, for the turbines. The Charmilles Co. has supplied nine vertical spindle turbines which develop 1,000 h.p. each at 94 r.p.m.

Italy.—Plans have been passed by the authorities for the erection of two new power stations capable of generating about 250 million kWh per annum. The cost of the construction, which is estimated at 100 million lire, will be defrayed by the Societá Elettrica Tridentina and associated enterprises.—*Reuter's Trade Service* (Milan).

A syndicate supported by the authorities of the four Italian provinces of Alexandria, Cuneo, Novara, and Imperia has drawn up plans for the utilisation of the water power of the River Tanaro. The scheme provides for the construction of five artificial lakes above the town of Ceva, and for five hydro-electric power stations, three of which would supply electricity in the Piedmont district and two in the Ligurian.

Falkirk.—Year's Working.—The report on the working of the Burgh electricity undertaking (engineer, Mr. T. M. Climie) for the year ended May 15th last, shows a total income of £32,093, as compared with £27,150 in the preceding year. Working expenses were £22,877, as against £20,559, leaving a gross profit of £9,216 (£6,591), to which was added a sum of £357, transferred from the reserve fund, making a total of £9,573. This was distributed as follows: Interest, £3,491; sinking fund, £5,089; property and income tax, £827; bad debts, £22; capital expenditure account, £144. The amount spent on capital account during the year, which included £15,782 for machinery, was £21,323. The sales of electrical energy increased from 3,303,340 to 4,356,469 kWh, and the maximum supply demanded from 2,200 to 2,380 kW.

Glasgow.—Progress during August.—The Corporation electrical engineer reports that 81 houses were wired during August, making the total to date under the scheme 1,180, and that the number of applications for the hire of appliances was 149, making the total 7,433.

Electricity Meters.—The Electricity Committee has recommended the introduction of pre-payment "penny-in-the-slot" meters into houses of tenants who have been displaced from slum properties under clearance schemes of the Corporation, the engineer to make the necessary arrangements with the Housing Committee.

Gravesend.—Loan.—The Corporation is applying for sanction to a loan of £39,858 in connection with the second 5,000-kW extension.

Irish Free State.—Newcastlewest (Co. Limerick).—The Town Commissioners propose to extend the electric lighting of the town, and have requested the local electric lighting company to prepare an estimate of the cost of the electric cables required for the purpose. The Commissioners are prepared to obtain a loan for the carrying out of the necessary extensions.

Kettering.—Year's Working.—The accounts of the Urban District Council's electricity undertaking (engineer: Mr. W. A. Walker) for the year ended March 31st last show a total income of £42,361, as compared with £37,592 in 1923-24. The working expenditure was £24,866, as against £19,807, leaving a gross profit of £17,496 (£17,785). After deducting capital charges there was a net surplus of £2,640. This was added to a balance of £9,722 brought forward from the preceding year, and £4,501 was appropriated for capital purposes, £1,080 contributed to the district rate, and the remainder carried forward. The sales of electrical energy increased from 3,932,134 to 4,502,400 kWh.

Leeds.—New Plant.—A new 26,000-kW stator, weighing 50 tons, was delivered at Leeds on September 24th and conveyed to the electricity station by a special wagon belonging to Messrs. H. Bentley & Co., Ltd., of Bradford. It was made by C. A. Parsons & Co., Ltd.

Llandovery.—Electricity Scheme.—The Urban District Council has given Messrs. Reynolds, of Swansea, permission to erect a power station in the town and to erect overhead cables to carry current at 220 V. A crude oil engine will be installed at the power station.

London.—St. Pancras.—The Borough Council has received sanction to a loan of £2,464 for additional coal handling plant at King's Road generating station.

Hammersmith.—The Electricity Committee has recommended to the Borough Council that extensions to the condensing water plant at the electricity works be carried out at an estimated cost of £18,695, and that the scheme be submitted to the Electricity Commissioners for approval.

Manchester.—Progress during July and August.—During the months of July and August the Corporation electricity undertaking showed an increase in connections of 3,208 kW, bringing the total to 268,349 kW; and the number of applications received for supply, including existing consumers for additional supplies, was 1,474, representing a total of 4,037 kW. The number of consumers connected increased by 533, and the number of hired cookers connected by 151, bringing the total actually on circuit to 932. Applications for the hire of cookers totalled 135.

Mansfield.—Electricity Supply.—The Corporation Electricity Committee has recommended that a supply of electricity be given to Rainworth. It is also recommended that the Corporation bear the initial cost of wiring and installing services, the consumer paying an increased charge per kWh to cover the cost of installation.

Northern Ireland.—Kilkeel (Co. Down).—The Rural District Council has given notice of its intention to apply to the Electricity Commissioners for Northern Ireland for a Special Order, authorising it to supply electricity in Rostrevor. It is proposed to lay mains in the district within two years from the receipt of the Order.

Oldham.—Loan Sanctioned.—The Town Council has received sanction to loans of £50,000 for mains and £15,000 for transformers.

Romsey.—Electricity Supply.—At a recent meeting of the Town Council it was reported that the Committee had been unable to make satisfactory terms with Christy Bros. and Co., Ltd., for a supply of electricity to the borough, and was in communication with Southampton Corporation and other bodies with a view to obtaining a supply.

Special Orders.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them authorising Southampton Corporation to supply electricity in certain parishes in the rural district of South Stoneham.

Application has been made by the Midhurst Brick Co., for an Order to supply electricity in certain parts of the rural districts of Midhurst and Westhampnett, and Major C. H. B. Prescott-Westcar has applied to the Commissioners to amend the Wiltshire Avon Electricity Order so as to include the district of Morgan's Vale and Woodfalls.

Tanfield (Durham).—Inauguration of Supply.—The Urban District Council's electricity scheme was inaugurated on September 23rd. The contractors for the overhead line, which is 14 miles long, were Messrs. Gray Brothers (Newcastle), Ltd., and the underground cable for 6,000 V, 1½ miles in length, was laid by Messrs. W. T. Henley's Telegraph Works Co., Ltd. Two transformer stations have been erected, one at Burnopfield and one at Tanfield Lea, at which points the energy is reduced from 6,000 V to 440 and 250 V.

Thornton-le-Fylde.—Electricity in Bulk.—At a meeting of the Urban District Council on September 17th, it was stated that the final terms had now been arranged with the Blackpool Corporation for the supply of electricity in bulk, and an effort was being made to secure an early supply for consumers.

West Ham.—New Electricity Charges.—The Borough Council has approved the following new electricity charges, submitted by the electrical engineer:—Multi-part tariff: A fixed charge per lamp varying from 8s. per annum, or 8d. per month for the equivalent of three 60-watt lamps installed to 4s. 4d. per annum, or 4½d. per month for the equivalent of 16 60-watt lamps installed, with an additional charge of 1d. per kWh for energy consumed for lighting, heating, and cooking. These charges include meter rent, and will be subject to a discount of 5 per cent. for prompt payment. No account will be taken of any points installed for heating or cooking purposes. Domestic house installations: A charge of 5s. or 6s. per point per annum, according to the period allowed for repayment of a loan of £5,000 which has been applied for to cover requirements under the scheme for two years. The charge covers the complete installation with plain shades, service cable, &c., and includes maintenance.

Weymouth and Melcombe Regis.—Year's Working.—The accounts of the Corporation electricity undertaking (engineer: Mr. G. Nicholson) for the year ended March 31st last record a total revenue of £26,551, as compared with £25,494 in 1923-24. Working expenses increased from £16,563 to £18,410, leaving a gross profit of £8,142, as against £8,931. After deducting capital charges, &c., there was a net surplus of £1,034, as compared with £2,392 in the preceding year. The capital expenditure during the year amounted to £18,678, the chief items being £9,373 for machinery and £8,371 for mains and services. The sales of electrical energy increased from 1,431,808 to 1,585,039 kWh, and the maximum supply demanded from 713 to 873 kW.

Wirral.—Electricity Scheme.—The decision of the Rural District Council not to accept the offer of electricity from Birkenhead but to proceed with its own scheme, will shortly give employment to 600 men in laying cables from Wallasey through the centre of Wirral to Ellesmere Port. It is hoped that some districts will have a supply before Christmas. In all, nine sub-stations will deal with the supply. It is estimated that before the end of two years 2,000 houses, as well as factories and institutions, will be receiving a supply. The policy is to avoid overhead distribution wherever possible.

Tramway and Railway Notes.

Australia.—N.S.W. Railway Electrification.—According to the *Industrial Australian and Mining Standard*, the preliminary work in connection with the electrification of the Sydney suburban railway system is nearing completion, and on August 2nd the final section of the quadruplication of the Illawarra line, between Rockdale and Hurstville, was opened for traffic. The Illawarra suburbs are now served with four tracks for a distance of nine miles, and further improvements will be effected in the train services, prior to electrification.

It is proposed that the new electric trains shall consist of units of two, four, six and eight cars, made up of motor and trailer cars alternately. The N.S.W. railway authorities state that the electrification of this railway line is making good headway. Already satisfactory progress has been made with the erection of overhead wires, signal boxes, and bridges. It is expected that electric trains will be in operation between Sydney and Sutherland by about June of next year.

Bournemouth.—NEW CARS.—The Corporation is to purchase 20 new tramcars.

Bradford.—MOTOR-OMNIBUSES.—The Tramways Committee has appointed a sub-committee to consider proposals for running motor-'bus services in districts between tramway routes as feeders for the tramways.

Brazil.—NEW RAILWAY.—*Commerce Reports* states that a concession has been granted by the State Government of Minas Geraes to Messrs. Armando Carneiro and Phillip A. Burton, for the construction and operation of a steam or electric railway between Uberaba and Porto Feliz, a distance of approximately 400 km. The line is to be of 1-metre gauge.

Cardiff.—YEAR'S WORKING.—The report on the working of the Corporation tramway undertaking (manager, Mr. R. L. Horsfield) for the year ended March 31st last, shows a total revenue of £284,155, as compared with £280,867 in the previous year. Working expenses amounted to £211,399, as against £201,993, leaving a gross profit of £72,756 (£78,874). After deducting capital charges, &c., a net surplus of £43,479 remained, of which £22,248 was contributed to the borough fund. The previous year's working resulted in a surplus of £39,314. The number of passengers carried increased from 41,123,280 to 42,985,404, a record for the undertaking, and the car-miles run from 3,012,626 to 3,220,186. The average traffic revenue per car-mile fell from 22.02d. to 20.74d.

Continental.—AUSTRIA.—According to *Commerce Reports*, preliminary plans for the electrification of the Austrian lines from Salsburg to Woergl and from Kufstein to Brenner are well under way. The Austrian Siemens-Schuckert-Werke has received an order for the construction and equipment of the sub-station at Feldkirch, and the construction of transmission lines from Ruetzwerk has been awarded to the A. E. G. Union and the Oesterreichische Bergmann-Elektrizitätsgesellschaft. The last concern is also constructing the cable from Bludenz to Feldkirch. Seven fast mountain passenger locomotives have already been shipped and are in operation between Innsbruck and Bludenz. In addition, 20 passenger locomotives have been ordered, of which 19 are already furnished. Twenty freight locomotives have been supplied and are in operation, and four fast freight locomotives for use in the valley are under construction. The total expenditure on this scheme during the second quarter of 1925 amounted to 8,525,000 schillings.

ITALY.—According to *Modern Transport*, the first Italian underground railway was inaugurated at Naples on September 20th. The cost of the line was 115 million lire, and the length is 13 km.

Ilford.—YEAR'S WORKING.—The report of the manager of the Urban District Council's tramway undertaking (Mr. L. E. Harvey) for the year ended March 31st last shows a total revenue of £68,036, as compared with £66,618 in the preceding year. Operating expenses amounted to £57,676, as against £57,199, leaving a gross profit of £10,360 (£12,434), to which was added rent from leased line (East Ham) and other items, making a total of £14,286. After deducting capital charges, there was a net surplus of £1,044, as compared with £2,480 in 1923-24. The number of passengers carried increased from 11,953,336 to 13,618,970, and the car-miles run from 926,183 to 958,058. The revenue per car-mile fell from 17.26d. to 17.04d.

India.—BOMBAY RAILWAY ELECTRIFICATION.—According to *The Times Trade and Engineering Supplement*, contracts have been signed by the Bombay, Baroda, and Central India Railway with British firms for the supply of rolling stock and for the construction of equipment in connection with the electrification of its suburban system. It is expected that the electrification of the 31 miles northward from Bombay terminus, covering the suburban traffic on this route will be completed by 1927. Work on quadrupling the lines as a preliminary to electrification is proceeding. The contract for the overhead equipment has been placed with Callender's Cable and Construction Co., and Messrs. Cammell Laird have been awarded the order for the rolling-stock consisting of 160 all-steel coaches of special design to suit Bombay suburban requirements.

The Western Ghat section of the Great Indian Peninsula Railway is expected to be completed by 1929.

Preston.—YEAR'S WORKING.—The accounts of the Corporation tramway (general manager, Mr. H. Clayton) for the year ended March 31st last, record a total revenue of £84,917, as compared with £85,625 in the 1923-24. Working costs totalled £70,028, as against £66,212, leaving a gross surplus of £14,889 (£19,414). After deducting capital charges, &c., there was a net deficit of £1,693, as compared with a surplus of £3,549 in the preceding year. The number of car-miles run fell from 1,229,429 to 1,214,817, and the total revenue per car-mile rose from 16.715d. to 16.776d. The number of passengers carried increased from 14,549,749 to 15,052,428.

TRAMWAY IMPROVEMENTS.—The Corporation Tramways Committee has considered the laying of double tramway lines in lieu of the existing single lines at various points and has recommended that application be made to the Ministry of Transport for consent to the scheme.

Salford.—YEAR'S WORKING.—We have received from Mr. J. S. D. Moffet, general manager of the Corporation tramway undertaking, a copy of his report, together with the statement of accounts for the year ended March 31st last. The total income amounted to £520,978, as compared with £534,804 in 1923-24, and working expenses were £412,312, as against £399,222, leaving a gross profit of £108,666 (£135,681), to which was added the sum of £10,290 for interest on investments, &c., making a total of £118,956. This has been dealt with as follows: Payment to local authorities for running powers, &c., £27,355; interest and sinking fund charges, £71,576; repairs, &c., to property in Church Street, £271; special reserve, outside authorities, £7,750; relief of rates, £10,000; depreciation and renewals fund, £2,005. The last two items represent the net surplus for the year. The previous year's working resulted in a surplus of £42,202. All the above amounts embody the figures for the motor-omnibus services. The number of passengers carried increased from 80,365,747 to 81,652,275, and the car-miles run fell from 6,307,301 to 6,238,336. The average total revenue per car-mile rose from 18.784d. to 18.829d.

Telegraph and Telephone Notes.

Australia.—TELEGRAPH AND TELEPHONE ESTIMATES.—The estimated expenditure on Federal public works for the financial year 1925-26 shows an increase of £1,608,988 for the Postmaster-General's Department. For the construction and extension of telegraphs and telephones, conduits, underground wires, land, and buildings, £6,000,000 has been allotted to the Postmaster-General's Department.—*Reuter's Trade Service* (Melbourne).

Brazil.—NEW RADIO STATION.—A wireless telegraph station, employing the Telefunken system, has been opened at Salinas, 70 miles east of Para, under the supervision of the Brazilian Telegraph Department. The charge for the transmission of messages to foreign vessels is 10 fr. for any number of words up to ten, and 1 fr. for each additional word.

China.—WIRELESS CONTROVERSY.—An official of the Foreign Office has stated that a French company recently opened a wireless station at Mukden, but ceased operations following a Japanese official protest. In spite of this protest, Marshal Chang Tso-lin has granted the French company authority to continue operation. The Japanese Ambassador in Washington will soon be instructed to begin conversations with the United States Secretary of State with regard to the Chinese wireless situation in the hope of reaching a compromise. The Japanese and American Governments do not favour the Chinese proposal to float a loan for taking over all wireless interests in China; international joint management is suggested as a possible solution.—*Reuter* (Tokio).

France.—STRIKE.—M. Chaumet, Minister of Posts and Telegraphs, has taken severe steps to punish the leaders in last week's two hours' telephone and telegraph strike. Five employés who went round the offices and pulled down switches, throwing the telephone apparatus out of action, have been dismissed. Ten others who were active in advising their colleagues to stop work have been placed on the resting list, and about 20 other men and women employés who took a prominent part in organising the strike have been changed from one office to another in the provinces, or severely reprimanded.—*Daily Mail*.

Smyrna.—TELEPHONE CONCESSION.—A contract was recently signed by the Minister of the Interior, acting on the part of the Turkish Government, by which a concession for the installation and operation of a telephone system was granted to the municipality of Smyrna for a period of 35 years. The municipality has agreed to obtain sufficient capital to cover all expenses, and the system will provide service for 2,000 subscribers. The concessionaire is obliged to complete the installation in the city of Smyrna within one year and three months of the procurement of the capital, and in the suburbs within two years. However, the terms of the contract authorise the municipality, upon the approval of the Minister of the Interior, to transfer the concession to a private company, provided the terms of the contract shall be observed by the transferee. The operation of the system is to be under the control of the Government, which has also retained the right to purchase the entire system and equipment within 15 years.—*Commerce Reports*.

The Telephone Service.—NEW EXCHANGE.—A new telephone exchange has been opened at Cholsey, in Berkshire.

THEFT OF CABLE.—Thirty-four London City telephones were out of order recently as the result of a theft of cable from street manholes by a gang of men.

LEEDS AUTOMATIC SERVICE.—The extension of the automatic telephone system to the suburbs of Leeds, as well as the big automatic central exchange, has been a long process, but is now practically completed, the new exchange buildings at Roundhay, Chapeltown, Headingley, and Stanningley being finished and the plant installed. Tests will occupy most of October, and the change-over is expected to be made early in November.

Radio Notes.

Birmingham.—New Plant.—It has been pointed out to us that it was hardly correct to describe the new transmitting plant at the Birmingham station, which was referred to in our September 18th issue, as having been built on similar lines to the plant at the Daventry high-power station. The apparatus in use at Birmingham is of a different manufacture from that at Daventry, and the actual circuit used is quite different, the water-cooled valve at Birmingham being a high-frequency magnifier, whereas the Daventry circuit is a modified choke-control circuit. The actual power in the aerial at Birmingham is 1 kilowatt, and at Daventry it is approximately 15 kilowatts. The new Birmingham transmitter is extremely compact and very easy to work, and from the reports that the B.B. Co. has received, it is a considerable advance on the set which it has replaced.

Ship's Wireless.—Wavelength Agreement.—By agreement between the British, Canadian, and United States Governments, merchant ships after October will cease operating their wireless apparatus on a wavelength of 300 to 450 metres when within 250 miles of the coasts of the three countries. The object is to prevent wireless broadcast programmes from being interfered with by Morse.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Ashford (Kent).—Urban District Council. Electricity meters. (See this issue.)

Australia.—Melbourne.—Postmaster-General's Department. Motor-generator sets for charging secondary batteries. (See this issue.)

Belgium.—October 7th. Belgian Ministry of National Defence, 10, Rue du Meridien, Brussels. Wireless telegraphy and telephony transmission and reception sets. Particulars for 4 fr. from the Cahier des Charges Special No. 583.

October 19th. Municipal authorities of Antwerp. Electric travelling crane at one of the dry docks. Particulars for 5 fr. from Hotel de Ville, Antwerp.

October 14th. Municipal authorities of St. Gilles, Brussels. Supply of a 2,500-kW turbo-generating set.

October 23rd. Belgian Post and Telegraph authorities at La Salle Madeleine, Brussels. Supply and laying of telegraph and telephone cables between Brussels and La Panne, Brussels and the German frontier at Hergenrath, Brussels and Lille, and between Brussels and Roosendael. Particulars for 9.50 fr. on application to Cahier des Charges Special No. 3-144.

October 7th. Supply and laying armoured telephone cables between Buggenhout and Baesrode. Particulars (Cahier des Charges Special No. 3-131) for 2.60 fr.

Birmingham.—October 8th. Board of Guardians. Electrical installation in the new extension of the nurses' home at Selly Oak Hospital. (See this issue.)

Edinburgh.—October 16th. Corporation. 12 electric tramcar trucks, electrical equipment of cars, and air-brake equipment. Specifications from the manager.

The Gas Department invites offers for the supply of steam-, motor- or gas-driven boosting plant at the Granton works. Particulars from Engineer, 15, Calton Hill, Edinburgh.

Edmonton.—October 13th. Board of Guardians. Electric lighting and power installation at Enfield House. (September 25th.)

Erith.—October 9th. Urban District Council. Cable, e.h.p., h.p., and l.p., dividing boxes, cable racks, &c. (See this issue.)

India.—India Store Department. October 14th. L.p. turbine-driven d.c. generating set, condensing plant, and accessories. (September 18th.)

Leeds.—October 20th. Tramways Department. 150 double-deck top covered tramcars complete, or, alternatively, 150 tramcar bodies, 190 tramcar trucks, including wheels and axles, 190 tramcar electrical equipments. (See this issue.)

Lichfield. — October 19th. Electricity Department. Transformers, switchgear, and cable connections; e.h.p. and l.p. cables, boxes, and roadwork; e.h.p. overhead transmission line. (September 25th.)

London.—London County Council.—Highways Committee. October 12th. H.p. and l.p. switchgear for Shoreditch L.C.C. tramway sub-station. (September 18th.)

Islington.—November 11th. Electricity Department. 3-phase, 6,000/6,600-V and two-phase or single-phase 2,500/2,000-V switchgear and accessories. (September 25th.)

H.M. Office of Works.—October 14th. Dismantling wiring and rewiring in conduit at Charity Commissioners' office, Ryder Street, W. (September 25th.)

Manchester. — October 7th. Electricity Department. One 10-ton hand-operated overhead travelling crane and gantry. Specifications from Mr. H. C. Lamb, manager, Electricity Department.

October 5th. Board of Guardians. Electric lamps required during year commencing October 1st, 1925. Forms of tender from Mr. J. Macdonald, clerk to Guardians, Union Offices, All Saints.

Newport (Mon.).—October 28th. Electricity Department. Electrically-driven pumps, pipework, valves, &c.; switchgear; water-screening plant. (See this issue.)

New Zealand.—Wellington.—Post and Telegraph Department. October 27th. Rubber-insulated wire.*

Public Works Department. November 24th. Neutral earthing reactors.*

December 8th. Steel transmission line supports for the Waikato power scheme.*

Rawdon.—October 5th. Board of Governors. Electric light installation at Mitchell Memorial Home. Specification, &c., from Mr. W. H. Brown, County Hall, Wakefield.

South Africa.—Johannesburg.—S.A. Railways. October 29th. Electric cables and wires.*

Cape Town.—October 14th. Electricity Department. Electric motors.*

Southend-on-Sea.—Light Railways and Electricity Department. House-service meters and demand indicators. (See this issue.)

Stoke-on-Trent.—October 12th. Electricity Supply Department. Two sets of steam air ejectors, and one centrifugal oil purifier. (September 25th.)

Switzerland.—Berne.—October 17th. Swiss Federal Railways. Supply and installation of three single-phase, 3,000-kVA transformers, switchgear, &c.; a similar equipment for the Freiburg transformer station; two 3,000-kVA transformers for the Kerzers transformer station; and three 3,000-kVA transformers and switchgear for the Burgdorf transformer station. Particulars from the Electrification Section of the S.B.B., Zimmer 166, 43, Mittelstrasse, Berne.

Uruguay. — Montevideo.—December 22nd. State Electricity Supply Works. December 28th. 200,000 metres r.i. wires and cables. 1,060,000 metres of special cable for outside use.*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Adwick-le-Street.—Urban Council. Accepted:—
Wiring 380 houses for electric light (£2,772).—Building & Colliery Supply Co., Ltd. The highest tender was £6,174.

Barnsley.—Town Council. Accepted:—
Ash elevator and bunker for the electricity works (£880).—W. J. Jenkins and Co., Ltd.

Brighton.—Lighting Committee. Accepted:—
Two switchboard panels (£159).—Metropolitan-Vickers Electrical Co., Ltd.

Works Committee. Accepted:—
Installation of electric lighting at Corporation depôt in Hollingdean Road:—

Bostel Bros., Ltd. (Accepted.)	**£184**
Page & Miles, Ltd.	232
R. Garrett	236
J. Taylor	250
C. B. Pennifold	257

Devizes.—Town Council. Accepted:—
Installing electric light in the Town Hall (£103).—James Bros. Twelve tenders were received, the highest being £197.

Dunfermline.—Dunfermline Combination Home and Hospital Committee.
Electric lighting installation (£1,200).—Jas. Scott & Co.

Epsom.—Urban Council. Accepted:—
Overhauling and repairing the Diesel engine at the electricity works (£677).—Carels Diesel & Steam Engines (London), Ltd.

Glasgow.—Tramways Committee. Accepted:—
Graphite brushes.—Kay & Co. and Messrs. Birkbys.
Commutators.—P. R. Jackson & Co., Ltd.
Time recorder.—International Time Recording Co., Ltd.
Alterations to goods hoist.—Waygood-Otis, Ltd.

Greece.—Athens.—The Technical Commission appointed to examine the tenders for the supply of electric light and power to Athens and the Piræus has rejected the offers of the existing Greek Electric Light Company and accepted, with certain reservations, those of the group consisting of the Power and Traction Finance Co., of London, in conjunction with the Greek National Bank and other banks. The proposals of this group involve a loan of £2,000,000 under the Trade Facilities scheme.—*Reuter.*

Hornsey.—Electricity Committee. Recommended:—
Switchgear for 300-kW motor-converter at Muswell Hill sub-station.—Park Royal Engineering Co., Ltd.
Erection of crane and rails at Muswell Hill.—Herbert Morris, Ltd.

Ilford.—Electricity Committee. Recommended:—
Crane, gantry, and runway at Goodmayes sub-station (£218); crane at Gant's Hill sub-station (£105).—H. Morris, Ltd.
Kiosk and transformer at New North Road sub-station (£156 for kiosk and £118 for transformer).—Foster Engineering Co., Ltd.
1¼ miles single cable, ¼ mile 2-core cable, ¼ mile 3-core cable.—Macintosh Cable Co., Ltd.
4 miles single cable.—Hackbridge Cable Co., Ltd.
6 miles single cable, 6 miles 3-core cable, 2 miles 4-core cable.—Deutsche Kabelwerke A.G.

Tramways Committee. Accepted:—
Trolley wire (10 1/16d. per lb.).—Frederick Smith & Co., Ltd.

Ipswich.—Electricity Supply and Tramways Committee. Accepted:—
15 single-decked trolley vehicles (£20,800).—Ransomes, Sims & Jefferies, Ltd.
15 do. do. (£20,940).—R. Garrett & Sons, Ltd

London.—POPLAR.—Electricity Committee. Recommended:
4-panel switchboard (£309), and 200-kVA transformer (£215).—Johnson and Phillips, Ltd.

ST. MARYLEBONE.—Highways Committee. Recommended:—
Refuse destructor plant. One 200-kW steam generator set (£1,995).—Browett, Lindley & Co., Ltd.
Electricity Supply Committee. Recommended:—
D.c. and a.c. ordinary and prepayment meters for 12 months.—Chamberlain & Hookham, Ltd.; Ferranti, Ltd.

Manchester.—Electricity Committee. Accepted:—
6,600-V sub-station switchgear, Burnage, Bowker Vale, and Guide Bridge sub-stations.—Metropolitan-Vickers Electrical Co., Ltd.
Steam-heating plant, Oldham Road "B" and High Street sub-stations.—H. Tattersall, Ltd.
Constructional steelwork, Burnage sub-station.—Lambourne & Co., Ltd.
150 weldless steel lamp columns and fittings and 12,000 yd. 3 in. weldless-steel tubes.—British Mannesman Tube Co., Ltd.
15-ton and 2½-ton cranes.—H. Morris, Ltd.
1½-ton runway.—Vaughan Crane Co., Ltd.
6,600-V switchgear, Dickinson Street sub-station.—Ferguson, Pailin, Ltd.
12 months' supply of electric cooking ranges.—Jackson Electric Stove Co., Ltd.; Cable Accessories Co., Ltd.; Metropolitan-Vickers Electrical Co., Ltd.
12 months' supply of ironclad switches and cut-outs.—Edison Swan Electric Co., Ltd.; J. H. Tucker & Co., Ltd.; General Electric Co., Ltd.; Baxendale & Co., Ltd.
Spare armature with motor rotor.—Metropolitan-Vickers Electrical Co., Ltd.

Annual Stores Contracts. Accepted:—
Insulating cloth.—L. Andrew & Co.
Insulators.—J. Macintyre & Co., Ltd.; Taylor, Tunnicliffe & Co., Ltd.; Gaskell & Grocott; Doulton & Co., Ltd.; Bullers, Ltd.
Tapes.—Callender's Cable & Construction Co., Ltd.; Siemens Bros. and Co., Ltd.; J. Bonas & Son; Johnson & Phillips, Ltd.; L. Andrew and Co.
Cotton and silk covered wire.—Pirelli-General Cable Works, Ltd.
Tinned copper and tin fuse wire.—Concordia Electric Wire Co.; Ltd.; L. Andrew & Co., Ltd.
Tinned steel binding wire.—Brunton, Ltd.

Central Purchasing Committee. Accepted:—
Lamps.—Drake & Gorham (Wholesale), Ltd.; W. E. Beardsall & Co., Ltd.; R. O. Brien & Co.; F. G. Ride & Co.; Hirst, Ibbetson and Taylor, Ltd.; Sloan Electric Co., Ltd.; Underwood (Manchester), Ltd.; Stella Lamp Co., Ltd.; B. I. & H. Cables, Ltd.

South Africa.—LADYBRAND, O.F.S.—Town Council. Accepted:—
Electric lighting scheme (£16,250).—Siemens (South Africa), Ltd. The estimate includes power station buildings and 100 house connections with meters complete.

Southend-on-Sea.—Corporation. Accepted:—
Wiring 89 houses, for the Corporation housing scheme (approx. £500).—F. M. Burley & Co.

St. Albans.—Board of Guardians. Accepted:—
Installation of electric drive at the laundry (£102).—Messrs. Giffen.

Forthcoming Events.

Institution of Electrical Engineers (Western Centre).—Monday, October 5th. At the Swansea Chamber of Commerce. At 6 p.m. Inaugural address by the chairman, Mr. J. W. Burr.
(South Midland Students' Section).—Tuesday, October 6th. At the Queen's Hotel, Birmingham. At 7.30 p.m. Address by the Chairman, Mr. R. H. Rawll.

Junior Institution of Engineers (North-Western Section).—Monday, October 5th. At the Geographical Society's Room, 16, St. Mary's Parsonage, Manchester. Annual general meeting and address by the chairman, Mr. J. D. Porteous.

Institute of Transport.—Monday, October 5th. At the Institution of Electrical Engineers, Victoria Embankment, W.C.1. Presidential address by Col. Sir Joseph Nall, D.S.O., M.P.

National Association of Supervising Electricians.—Tuesday, October 6th. At the Junior Institution of Engineers, 39, Victoria Street, S.W. At 7.15 p.m. Presidential address by Mr. F. Gill.

International Motor Exhibition.—October 8th-17th. At Olympia, W.

Electrical Trades Commercial Travellers' Association.—Saturday, October 10th. At the Manchester Hotel, Aldersgate Street, E.C. At 7.30 p.m. Bohemian concert.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names of makers or suppliers of:—
MARTIN'S fuses.
BARKAY reflectors (photographic).
ZEHNDER magnetic chucks.

Notes.

Water Dispute at Chester.—A peculiar situation has arisen at Chester affecting the Corporation's hydro-electric works, due to the alleged wastage of water by a local firm's leaving its sluice gates open. The Electricity Committee points out that this wastage prejudices the efficient working of the electricity works; consequently the Town Clerk wrote to the firm concerned asking it not to use its sluices in such a way as to prejudice the rights of the Corporation. The firm replied objecting to being dictated to in a peremptory manner as to the way in which it should exercise its rights, and, whilst making a temporary concession, said that it would not be repeated. The Corporation is taking opinion of counsel on the subject.

The Electrical Trades Benevolent Institution.—THE ANNUAL FESTIVAL. — The President for this year, Mr. Edgar S. Barralet, has issued a letter stating that the Festival Dinner of this Institution will be held at the Trocadero Restaurant, on Wednesday, November 4th.

"The main object of this Festival," he says, "is to supplement and emphasise the appeal that I now have the pleasure of making to you for contributions to the funds of this Institution for carrying out the good objects as set out above.

"The ever-widening development in the field of electrical industry, with the greater number of people engaged in it, makes it certain that increased calls will be made on the funds of the Institution, and its ability to meet them depends on the generous support of those engaged in the electrical industry, and trades dependent on it for their prosperity.

"Should you not be able to attend the Festival, I would ask you to send your contributions to the Fund to me or to F. B. O. Hawes, Esq., at the above address.

"It would be a great kindness if you could have a copy of this appeal posted on a notice board in your offices, in order to give it as wide a publicity as possible."

The address of the honorary secretary, Mr. F. B. O. Hawes, is 98, Grosvenor Road, S.W.1. We believe that to take a ticket for the festival, though unable to attend it, is much less advantageous than to send a contribution to Mr. Hawes.

American Generator Explosion.—A generator explosion in the plant of the Lake Shore Electric Railway Co. at Avon, Ohio, on August 23rd resulted in a fire which destroyed the plant, causing a loss of $250,000. A dozen or more villages extending along the shores of Lake Erie for about 40 miles depended on the plant for their lighting service and were thrown into darkness. Interurban cars were held up. Energetic steps to restore power were at once taken, and by the following night the Ohio Public Service Co.'s Edgewater station at Lorain was tied in and service to all the communities affected was resumed.—*Electrical World.*

The Cycle Show.—The annual Motor Cycle and Cycle Exhibition was held as usual at Olympia, but at an earlier date this year, namely, from September 21st to 26th, the opening ceremony being performed by Sir Burton Chadwick, Parliamentary Secretary to the Board of Trade.

Electrical interest was confined to the accessories section, excepting one electric tricycle that was shown by the Argson Engineering Co., Ltd. It is intended for the use of invalids and the aged; it will proceed at graduated speeds of from one to seven miles per hour, will climb a gradient of one in five, and has a radius of from 35 to 40 miles on a single charge. A D.P. "Kathanode" battery of 56 ampere-hours capacity at 24 volts is carried on the main tubular steel frame of the chair beneath the seat. A small electric motor is mounted on the back axle and drives the two rear wheels through reduction and differential gear, totally enclosed and running in an oil bath. Steering, speed, and brake control are combined in one tiller with a stirrup handle; by swinging the tiller to the right or left the chair is steered as desired, by a twist of the stirrup handle the rider can cause the chair to proceed either forward or backward at graduated speeds, or bring into operation a gradual or powerful electric brake, the respective speeds and brakes being indicated by a clearly visible pointer. A band brake actuated by a long lever is conveniently disposed on the near side of the chair, and the equipment includes electric lamps and an ampere-hour meter.

Messrs. Allen-Liversidge, Ltd., became, as from September 1st, the sole concessionnaires for marketing in Britain and export purposes the well-known E.C.L. cast-aluminium electric and acetylene lamps for commercial and other vehicles. The dual-purpose lamp is the most recent product of the company's motor-cycle lighting department, and possesses several features. It is designed so that by one or two slight adjustments it can be used either with electricity or acetylene as the lighting medium. The reflector with which it is fitted is detachable with slight pressure and a twist with the fingers, and its removal reveals a Mangin lens permanently fitted at the back of the lamp's interior, through which the bayonet fastening (electrically wired) for the bulb projects. When the electric lamp is removed, a special burner-carrier fitted with an ordinary open (Roni) burner can be set in the same bayonet joint which previously held the electric lamp. The whole operation of changing over from electricity to acetylene, or *vice-versa*, is a matter of a couple of minutes, and at the back of the lamp, readily accessible to the rider's hand while travelling, is a small metal plunger which controls the focus of the headlamp, so that the width of beam may be altered from the normal long narrow beam to a broad beam of diffused light which clearly illuminates both sides of the road, is claimed to be non-dazzle in character, and is of assistance in fog and when taking sharp corners.

In the garage equipment section special attention is drawn to the company's oxy-acetylene equipment for repairs to accumulators, &c.

Magnetos, lighting and ignition sets, impulse starters, "Fabroil" silent timing gears, &c., were exhibited by the British Thomson-Houston Co., Ltd. The magnetos are

rotating-armature light-weight machines, a feature being that the main housing is die-cast in one piece around the laminated poles. The combined lighting and ignition sets manufactured by this company are of two types; in one a magneto and generator are mounted as a combined unit, while in the "Sparklight" set the current for lighting is derived from the magneto. In the first-mentioned sets a voltage is generated in the windings of the drum-type armature of sufficient value to start charging the 6-volt accumulator when a speed of from 10 to 12 miles per hour is attained; by fitting an automatic cut-out under the brush gear, wiring is reduced. Lamps of pleasing design and durable finish are supplied with each set, whilst the battery is of sufficient capacity, without the aid of the generator, to supply 8 or 9 hours' light continuously.

Messrs. Rotherham & Sons, Ltd., exhibited amongst other things the "Barnet" universal sparking plug terminal, which is instantly detachable from either the plug or the h.p. wire lead. It eliminates all nuts, washers, and ferrules, and is fitted in a few minutes without tools, forming a variable spark gap by the rotation of a fibre ring. The terminal forms a simple means of testing the ignition on any number of cylinders at the same time when the engine is working and turned by hand, and it will fit any sparking plug except Lodge "all-weather" and similar special types.

Electro-plating plant was exhibited by Messrs. W. Canning and Co., Ltd., and Graner & Wells, Ltd., and the following firms were also represented: Batteries, Ltd. ("NI-FE"); Robinson Engineering Works, Ltd. (K.L.G. plugs); Astra Dynamo Co., Ltd. (lighting sets); Lodge Plugs, Ltd. (sparking plugs); A.C. Sphinx Sparking Plug Co., Ltd.; Powell and Hanmer, Ltd. (lighting sets and lamps); North & Sons, Ltd. ("Halford" magnetos and speedometers); Lucas Electrical Co., Ltd. (magnetos and lighting equipment); C. A. Vandervell & Co., Ltd. (lighting and ignition plant); Rotax (Motor Accessories), Ltd.; and the M.L. Magneto Syndicate, Ltd.

A Volta Centenary.—Arrangements are already in progress by the Italian Associazione Nazionale Industrie Elettriche to celebrate in a suitable manner the centenary of the death of Alessandro Volta, which took place near Como on March 5th, 1827.

Lectures.—The first of a series of University extension lectures on "Electricity in Every-day Life" was given at Plymouth Technical School on September 25th by Prof. F. H. Newman. In the course of his lecture Prof. Newman said that if the scheme for building a series of eight central power stations was proceeded with, it was probable that Plymouth would be the site of one of them. Speaking of the generation of electricity by water power, he referred to Dartmoor as a possible source of much power of this description, and mentioned that under a scheme now abandoned it had been proposed to build a power station there for taking the energy from a high-level reservoir at Totnes.

Women and Electricity.—A plea for electricity in the homes of the people was made by several speakers at the recent Birmingham conference of the National Council of Women of Great Britain. A resolution was brought forward urging on the Government the importance of developing a comprehensive electrical scheme for the whole country. Moving the resolution, Mrs. Bridgwater (Birmingham Branch) said that all new houses erected by public bodies should be wired for electricity. Miss Griff (chairman of the Women's Engineering Society) seconded, and the resolution was agreed to.

Birmingham Electric Club: 21st Anniversary.—On Friday, October 23rd, this Club will celebrate its 21st anniversary with a ladies' evening, ball, and whist drive at the Grand Hotel, Colmore Row, Birmingham. The Grosvenor Suite and Windsor Room have been engaged for the occasion. There will be a reception from 7 to 7.30 p.m.; whist from 7.45 to 9.45 p.m.; and dancing from 7.45 p.m. to 2 a.m.; with a supper interval from 10 o'clock to 11 o'clock. Tickets (10s. 6d. each, inclusive of supper) can be obtained before Saturday, October 17th, from the hon. sec., Mr. N. Deykin, 193, Station Road, Wylde Green, Birmingham.

Fatality.—An inquest was held at Manchester on September 24th on Alfred Dudley Drayson (22), an apprentice, who was killed on September 16th at the works of Messrs. Mather & Platt, Newton Heath, Manchester. Deceased, whose home was at Surbiton, Surrey, was a B.A. (Mechanical Science) of Cambridge. Mr. Arthur Merrill, chief electrical tester of the department in which Drayson worked, said that the deceased had been in his department 17 days and was very competent. Witness left him near the electrical switchboard, and on hearing a shout looked round and saw him on the floor. Witness rushed towards him and found that he was clear of all wires. Answering Mr. P. M. Oliver (who represented the family), witness said that Drayson might have slipped on the boards, which were darkened with oil, though in his opinion that did not happen. Had he slipped on the floor and clutched the switches, he would not have been able to release his grip. If his hand touched the "live" metal work he would have received a shock at 440 V. Acknowledging that the cause of death was a matter of conjecture, the Coroner said that it appeared that Drayson tried to keep his eyes on the switchboard meter while putting in the switches, and touched the "live" metal. "So far as I can gather," added the Coroner, "I do not think he slipped. The switchboard is the usual switchboard, and as far as I can judge, there was nothing wrong." A verdict of "Accidental death" was returned.

Appointments Vacant.—Distribution engineer (Rs. 1,000 per month) for supply undertaking in India. Plumber-jointer for the Hove Corporation Electricity Department. Showroom attendant (£250) for the Borough of Mansfield Electricity Department. Clerk, for the Colne Corporation Electricity Department. Assistant mains engineer for the City of Norwich Electricity Department. Scientific assistant for research in connection with electrical ignition appliances (£250 +), draughtsmen (£252 and £205), for the Royal Aircraft Establishment, Farnborough, Hants. Boiler-house assistant engineer and draughtsman, for the Hull Corporation Electricity Department. Junior mains assistant, for the Great Yarmouth Corporation Electricity Supply and Tramways Departments. Lady cook demonstrator, for the Beckenham U.D.C. Electricity Department. Two plumber-jointers, for the Mexborough U.D.C. Electricity Works. (See our advertisement pages to-day.)

New Spanish Electrochemical Works.—Large new works for the production of synthetic ammonia are approaching completion at La Felguera, in the province of Asturias, Spain, for the Sociedad Iberica del Nitrogeno, of Bilbao. The Claude process is being adopted, and the necessary electrical energy for the new works will be supplied from the 12,000-h.p. steam station at La Felguera of the Sociedad Co-operativa Electrica de Langreo and from the hydro-electric station of the Sociedad Hidro-Electrica del Cantabrico.

Automatic Train Control on Pennsylvania Railroad.—A contract has been entered into between the Pennsylvania Railroad and the Westinghouse Air Brake Co., on behalf of the Union Switch and Signal Co., for the installation of an automatic train control system on 700 locomotives and 1,000 miles of double track belonging to the railroad. The installation will cost between 6,000,000 and 7,000,000 dollars. The announcement of the contract was made by Mr. J. L. Humphrey, president of the Westinghouse Co.—*Reuter's Trade Service* (Pittsburgh).

Association of Special Libraries and Information Bureaux.—The idea of providing an opportunity for intercourse between those engaged in collecting and distributing information in the fields of science, industry, and public affairs, has met with gratifying success, under the auspices of this Association. Sir Arthur Steel-Maitland, Minister of Labour, opened a conference at Balliol College, Oxford, which lasted from September 25th to 28th, and was attended by over 200 delegates of organisations ranging from the scientific societies and large libraries, to research institutes and smaller associations of experts, in the aggregate probably representing more than half a million intellectual workers.

The attendance included M. Otlet, of the Institut International de Bibliographie, Brussels, and other visitors from Germany, Holland, and the United States, and the international aspect of the subject was further emphasised by a valuable address from Prof. Gilbert Murray, on the work of the Committee of Intellectual Co-operation of the League of Nations.

Dr. Chalmers Mitchell, F.R.S., spoke of the "World List of Scientific Periodicals," which has just been published with the help of the British Museum authorities; it discloses the existence of some 25,000 separate journals. The problems of translation and collective abstracting were dealt with in papers by several of the leading authorities in the engineering and chemical sciences. An attempt was made to give the conference some insight into the library methods of the daily and technical Press.

The information sections of such Government departments as the Board of Education, Ministry of Health, and Imperial Institute were described. Methods of filing and classifying library matter and correspondence were dealt with by Mr. R. Borlase Matthews, Mr. S. Jast (chief librarian of the Manchester Public Libraries), and others.

The Shannon Power Scheme.—At the annual meeting of the Electricity Supply Association of Ireland, referred to in our last issue, Mr. P. L. Spalding (Dundalk) mentioned the wages and hours dispute at Limerick on the launching of the Shannon scheme, and pointed out that the difference between 8d. per hour, estimated by the contractors, and 1s. 3d. per hour demanded by labour meant an enormous additional cost on the contract. Based on the estimate that 3,000 men would be employed, it meant £125,000 per annum, and, multiplied by the three years the work would be in hand, it would come to £375,000 for labour charges alone. In his opinion the estimate of receipts had been as much overstated as that of expenditure had been understated.

Mr. Wm. Ireland said Mr. Spalding's point was a serious one. It was only the beginning of the trouble, and he thought a protest should be sent to the Government against the scheme.

Mr. Wm. Hewat, president, said that, the scheme having passed Parliament, it was their duty and the duty of other bodies to render any assistance possible towards making it a success, whether they agreed with the methods taken or not. A question just as important as the other was the Bill that would regulate the distribution of electricity. He hoped the Government in promoting that measure would not ignore the interests of the country as they had done in the previous case.

At the Association's dinner Mr. Blythe, Minister of Finance, who was the chief guest, said he thought it had come to be realised that the development of electricity supply in Ireland was one of the matters that would determine to a very large

extent the degree of prosperity that they were to have in the future. The farmers would have to use their brains in a way in which they had not used them in the past, and they would find that electricity would be a powerful agent for their service. He felt certain that when legislation to control production and supply under the Shannon scheme came to be considered bodies like the Electricity Supply Association would be very useful in helping to work out that part of the scheme which had to do with the consumer.

Dr. T. McLoughlin, Free State representative of the contractors, states that there is no intention on the part of the firm of importing German labour; applications for employment have been received from all over the State, and an employment bureau will be opened in Dublin for registration, &c. The trouble in Limerick will not materially affect their plans, as the number of men employed in Limerick will be relatively small. It is now thought that the real work on the scheme will be undertaken in the first instance at Killaloe.

For the first time the Shannon scheme is mentioned in the Free State Revenue Returns, a temporary advance of £100,000 being announced under the terms of the Shannon Electricity Act of the last session of Parliament.

End of Summer Time.—Our readers are reminded that Greenwich mean time will be reverted to at 2 a.m. on Sunday next (October 4th).

Educational.—UNIVERSITY OF LONDON, UNIVERSITY COLLEGE.—A course of six lectures on "Mercury Vapour Lamps" and "Mercury-Arc Rectifiers" will be delivered by Prof. J. A. Fleming, F.R.S., on Wednesdays at 5 p.m., beginning on October 28th, 1925. The course is open both to members and non-members of the University. Fee, £1 11s. 6d. Application for tickets of admission should be made to Dr. Walter W. Seton at University College, London.

EDUCATION IN LONDON.—A "Guide to Continued Education in London" has been received from the University of London Press, Ltd., price 6d. net; it gives particulars of the facilities for continued education provided by the London County Council, of which many residents are still unaware. The Council's scheme is of very wide scope, as is proved by the contents of this brochure; lists of institutions providing evening classes in commercial and technical subjects are given, with the days and hours of meeting, and references are included to pamphlets on specific subjects, which are supplied gratis on application. Information regarding scholarships and exhibitions is given in a special handbook published by Messrs. P. S. King & Son, price 3d. plus postage.

An Electrical Fire Claim.—It is reported that the California Wharf and Warehouse Co. and the Balfour-Guthrie Co. are claiming damages to the extent of $902,592 from the Great Western Power Co., of California, for alleged negligence which caused the destruction of their warehouses and properties by fire last year. The claimants state that the source of the fire was the transformer room in one of the warehouses. The power company denies responsibility for the loss.

Institution Notes.

Institution of Electrical Engineers (Western Centre).—The opening meeting of this Centre will take place on Monday next, October 5th, at the Chamber of Commerce, Swansea, when Mr. J. W. Burr, the chairman, will deliver his address. Other events for the session will be:—

November 2nd (Bristol).—"Domestic Electrification," by Mr. J. W. Beauchamp.

November 30th (Cardiff).—"Switchgear Developments during the Past Twenty Years," by Mr. J. H. Thomas.

January 11th, 1926 (Swansea).—Annual dinner and President's visit.

National Association of Supervising Electricians.—On Tuesday, October 6th, Mr. Frank Gill, M.Inst.C.E., M.I.E.E., will deliver his presidential address at the Junior Institution of Engineers, 39, Victoria Street, S.W. Mr. J. S. Highfield will take the chair at 7.15 p.m.

Diesel Engine Users' Association.—VISIT TO LEWES.—At the invitation of the Lewes and District Electric Supply Co., Ltd., the committee of the Association recently visited that company's generating station, which is of particular interest, inasmuch as it was the first electricity generating station in the country originally equipped with steam engines to have been completely converted to heavy-oil engine plant. At present the installation consists of three "English Electric" Diesel engines and one Mirrlees-Watson Diesel set. The last-mentioned engine has been in regular commission since it was first installed in 1908. The committee was afterwards entertained at luncheon by the directors of the company. Mr. C. G. Tegetmeier, chairman, referred to the very satisfactory progress that had been made by the Lewes Company during the last few years, which, he thought, was to be attributed largely to the economical working of the Diesel engines. Mr. A. W. A. Chivers, president of the Association, was pleased to see that the operating costs of the Lewes Company during the past year both with regard to lubricating and fuel oils, compared remarkably well with those of other undertakings, and he felt sure that it would be impossible to obtain such good results with any other form of plant or with bulk supply, having regard to local conditions and the characteristics of the load to be dealt with. The Electricity Commissioners' bulk supply policy could easily be carried too far and might result in the public having in certain cases to pay a higher price for their supply.

Incorporated Municipal Electrical Association.—YORKSHIRE CENTRE.—The Lord Mayor of York (Sir Robert Kay) extended, at a luncheon at the Mansion House on September 24th, a welcome to the members of the Yorkshire Centre of the Incorporated Municipal Electrical Association, who were holding their annual meeting in the city, twenty-four municipal undertakings in the Centre being represented. Mr. W. Rogerson (Halifax) president, acknowledged the welcome. The principal item on the programme was a visit to the hydro-electric station at Linton-on-Ouse, some twelve miles up the river from York. The visitors were shown over the station by Mr. E. J. Nichols, city electrical engineer, who was accompanied by the chairman of the Committee, Alderman C. Shipley. The annual meeting of the Centre at York later was held in private. Mr. W. Rogerson (Halifax) was re-elected president, Major Barker (Barnsley) vice-president, and Mr. H. G. Fraser (Wakefield) hon. secretary. The representation on the Yorkshire Centre Council was fixed as follows:—Large towns, Sheffield, Bradford, Hull; medium towns, Barnsley, Wakefield, Halifax; small towns, Batley, Bridlington, and Shipley. An invitation from the Grimsby Town Council to hold next year's meeting at Grimsby was accepted.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

The new Agecroft station of the Salford Corporation, the description of which is concluded in this issue, was designed by Mr. J. A. ROBERTSON, of Manchester. Mr. Robertson, whose portrait appears herewith, was born in 1869. He entered the engineering industry by becoming an apprentice with James White (later Kelvin & White), of Glasgow. He became chief electrical engineer to Wm. Denny Bros., Dumbarton, and, later, was appointed assistant electrical engineer to the Stirling Corporation. In 1902 Mr. Robertson took over the position of chief electrical engineer at the Greenock municipal undertaking, and after a stay of 12 years transferred to the

Photo by] *[Lafayette, Manchester.*

Mr. J. A. Robertson, M.I.E.E., M.I.Mech.E.,
who was responsible for the construction of the Agecroft (Salford) station.

equivalent position at Salford, where he remained until 1922, when he resigned in order to devote the whole of his time to consulting practice. While at Greenock he erected the Dellingburn power station, and the Frederick Road station at Salford was modernised by him. Mr. Robertson includes a number of local authorities and private companies in his *clientèle*. One of his most recent undertakings is the Ribble power station at Preston. Mr. Robertson has been chairman of the Scottish and North-Western Centres of the Institution

of Electrical Engineers, and he is a member of the Institution of Mechanical Engineers.

Mr. S. J. Watson, the borough electrical engineer of Salford, to whose responsibilities that of the new Agecroft station has been added, is a native of Dover and was educated there. Upon leaving school he became a pupil with G. E. Belliss and Co., Birmingham (the predecessors of Belliss & Morcom, Ltd.), and later secured the position of assistant engineer with the Brush Electrical Engineering Co., Ltd. His connection with the electricity supply industry commenced with his appointment as station superintendent by the National Electric Supply Co., Preston. In 1896 Mr. Watson became engineer and manager of the Bury electricity undertaking, and in 1923 he was appointed to his present position. He was president of the I.M.E.A. for the 1917-18 session, and he has also been vice-president of the Institution of Civil Engineers, Manchester and District Association (1925), and chairman of the Manchester local section of the Institution of Electrical Engineers (1909).

Mr. S. J. Watson, M.Inst.C.E., M.I.E.E.
Borough Electrical Engineer of Salford.

Mr. S. Hann, the Stoke Newington Borough Electrical Engineer, who has been indisposed since the opening of the borough electricity showrooms and extensions and was granted leave of absence in July, is in Switzerland recuperating.

Mr. James D. Dow, for many years sales manager of the old Armorduct Manufacturing Co., Ltd., has now been appointed the managing director of the Anglo Electric Co., Ltd., which controls the sales of "Armorduct" cables.

On September 23rd, the St. Helens Town Council considered the resignation of Captain Vane-Moreland from the position of tramway manager. The chairman of the Tramways Committee said that Mr. Vane-Moreland had only been in office since November last, being appointed at a salary of £550. That was not sufficient to induce a suitable man, who besides being an engineer, must have knowledge and experience as a commercial man, to stay with them. The Corporation had had three managers in five and a half years. It was decided that applications for the vacancy be invited at a commencing salary of £650.

Mr. H. J. Barton Chapple, Wh.Sch., B.Sc., &c., is resigning his lectureship in Electrical Engineering (Radio Specialisation) at the Bradford Technical College, to join the senior technical staff of Radio Press, Ltd., Brush House, London.

Mr. George Hughes, C.B.E., chief mechanical engineer of the London, Midland & Scottish Railway, is shortly to retire. He will be succeeded by Sir Henry Fowler, K.B.E.

Mr. Guy Burney, late managing director of the Sterling Telephone & Electric Co., Ltd., has now returned from the Continent, and has opened offices at Morning Post Building, 346, Strand, London, W.C.2 (Telephone: City 2373). Mr. Burney proposes to interest himself in the development of patented articles—mechanical, electrical, and other kinds—and he will be pleased to hear from his old friends in the industrial world, and others desirous of placing any new invention before him.

Dr. G. C. Clayton, C.B.E., M.P., and Professor H. C. H. Carpenter, F.R.S., have been appointed to be members of the Advisory Council to the Committee of the Privy Council for Scientific and Industrial Research.

The Croydon Corporation Electricity Committee recommends the appointment of Mr. Lees, constructional assistant, as constructional engineer.

Mr. W. H. Peak, O.B.E., has been appointed managing director of the Sterling Telephone & Electric Co., Ltd., in succession to Mr. Guy Burney, who recently resigned, and Mr. Charles E. Hunter has succeeded the late Mr. Max R. Lawrence as works manager. We understand that Mr. Peak retains his position as managing director of the Relay Automatic Telephone Co., Ltd.

Mr. H. H. Spencer, who recently resigned his position as chief assistant engineer in the Glasgow office of Messrs. Crompton & Co., Ltd., has taken up a similar position with Messrs. F. & A. Parkinson, Ltd., in their London office, 47, Victoria Street, W.1. At a meeting of the Chelmsford Engineering Society, held on September 24th, Mr. Spencer was presented with a travelling clock on the occasion of his marriage. The presentation was made by the president (Mr. T. W. Cooper, M.I.Mech.E.) as a mark of appreciation of the work done by Mr. Spencer as secretary in the early days of the Society.

Obituary.—Prof. E. H. Barton, F.R.S.—We regret to record the death, which occurred suddenly on September 23rd, at Nottingham, at the age of 67 years, of Professor Edwin Henry Barton, Dean of the Faculty of Pure Science in the University College of Nottingham. He was the author of a number of text-books and a contributor to the scientific Press, as well as to the *Proceedings* of the Royal Society, the Physical Society, &c. *The Times* states that Prof. Barton had recently been busying himself with the plans for his department in the new University building which is being erected in University Park, Nottingham, by Sir Jesse Boot. Arrangements had been made for him to give a series of talks to be broadcast throughout the British Isles.

We are sure that many of our readers in the electrical profession and industry will desire to associate themselves with the Electrical Review in an expression of deep sympathy with Mr. A. H. Walton, M.Inst.C.E., of the British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C., in the loss of his wife. Mrs. Walton passed away on September 24th, after a few days' illness.

New Companies Registered.

Reflex Radio Co., Ltd. (208,575).—Private company. Registered September 23rd. Capital, £1,000 in £1 shares. Objects: To acquire the business now carried on by the Reflex Radio Co. at 45, Stamford Hill, N.16, and to carry on the business of manufacturers of and wholesale dealers in all electrical and mechanical appliances and scientific instruments (excluding sparking plugs), and all parts, fittings and accessories for these, but more particularly with regard to wireless telegraphy or telephony, &c. The life governing directors are:—A. T. Izzard, 118, Evering Road, Stoke Newington, N.16, radio engineer; R. E. Izzard, 198, Lower Clapton Road, Clapton, E., radio engineer. No share qualification required. Secretary: J. R. Homer, 45, Stamford Hill, N.16.

McGoff & Vickers, Ltd. (208,672).—Private company. Registered September 28th. Capital, £2,000 in £1 shares. Objects:—To carry on the business of electricians, electrical contractors, electrical, mechanical, and general engineers, manufacturers of electric or other motors, electric or other lighting sets, toys of all kinds, copper and brass founders, &c. The permanent directors are:—E. H. McGoff, 23, Fitzclarence Street, Liverpool; G. D. Vickers, "Rookwood," St. Helens Road, Ormskirk; A. Piggott, "Arranmore," Latham, Burscough; W. S. Roberts, "Newby," Ruff Lane, Ormskirk; and H. Chappell, Ruff Lane, Ormskirk. The first two named are managing directors. Qualification, 200 shares. Solicitor: James Roberts, 5, Harrington Street, Liverpool. Registered office: 12, Johnson Street, Liverpool.

Official Returns of Electrical Companies.

Whitfield Electrical Co., Ltd.—Debenture dated August 29th, 1925, to secure £2,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Mrs. C. Page, 15, Buckingham Mansions, Hampstead, N.W.

Quead, Ltd.—E. A. Hurpham, of the Commercial Trades Protection Association, 133, Finsbury Pavement, ceased to act as receiver or manager on September 17th, 1925.

British Illuminated Signs, Ltd.—Satisfaction in full on September 11th, 1925, of mortgage by debenture dated December 6th, 1923, and mortgage collateral thereto dated December 20th, 1923, securing £800.

Nordisk Electrical Power Co., Ltd. (140,530).—Return dated December 31st, 1924 (filed August 5th, 1925). Capital, £10,000 in £10 shares. All shares taken up. £20 paid. £9,980 considered as paid. Mortgages and charges, nil.

Nathan & Allen, Ltd. (174,343).—Return dated June 8th, 1925. Capital, £10,000 in £1 shares. 3,450 shares taken up. £1,100 paid. £2,350 considered as paid. Mortgages and charges, nil.

E. & C. Gates, Ltd. (172,187).—Return dated December 31st, 1924 (filed May 8th, 1925). Capital, £3,000 in 2,700 preference and 300 ordinary shares of £1 each. 1,011 preference and 300 ordinary shares taken up. £723 paid on 723 preference shares. £588 considered as paid on 288 preference and 300 ordinary shares. Mortgages and charges at date of return, nil. Since registered: Series of debentures for £4,000, authorised and all issued April 7th, 1925.

F. B. Hellon & Co., Ltd. (173,480).—Return dated June 17th, 1925. Capital, £4,000 in £1 shares. 3,000 shares taken up. £3,000 paid. Mortgages and charges, nil.

Caffin & Co., Ltd. (173,927).—Return dated June 5th, 1925. Capital, £25,000 in £1 shares. 16,002 shares taken up. £8,502 paid. £7,500 considered as paid. Morgages and charges, nil. Return of allotments made up to June 9th, 1928, shows a further 500 shares allotted for cash.

C. T. Briscoe & Son, Ltd. (173,926).—Return dated March 11th, 1925. Capital, £5,000 in £1 shares. 2,000 shares taken up. £110 paid. £1,800 considered as paid. Mortgages and charges, £1,000.

Premier Private Telephone Co., Ltd. (174,408).—Return dated August 4th, 1925. Capital, £2,000 in £1 shares. 1,200 shares taken up. 15s. per share called up on 800 shares. £575 paid, leaving £25 in arrears. £400 considered as paid on 400 shares. Mortgages and charges, £308 6s. 3d.

City Notes.

Reports and Meetings of Electrical Companies; Dividend Results, &c.

Halifax and Bermudas Cable Co., Ltd. The report for the year ended June 30th last states that there was a balance on working of £18,999, as compared with £21,654 in 1923-24. The addition of £43,626 from the previous year makes available £62,625. The deduction of expenditure on repairs and the interim dividend leaves £47,291. It is proposed to pay a further dividend of 5 per cent., free of tax, making 10 per cent., tax-free, for the year, and to carry forward a balance of £44,791. The company's cable was interrupted on two occasions during the year, and faults developed in the shore ends at Halifax and Bermuda. The cable is now in first-class condition, and should be free from interruption for a long period.

Indian Companies. *Tata Hydro-Electric Power Supply Co., Ltd.*—Mail dispatches from Bombay state that the net profit for the year ended June 30th last was Rs. 25 lacs, subject to adjustment on final audit, after making the usual allowance for depreciation and income tax. The issued capital of the company is Rs. 2,80,00,000.

The net profit of the *Andhra Valley Power Supply Co., Ltd.*, for the year ended June 30th last was Rs. 17 lacs, subject .o adjustment on final audit and to provision for depreciation. The issued capital of the company is Rs. 2,10,00,000.

German Companies. The *Rheydt Cable Works Company* contemplates the distribution for 1924 of a dividend at the rate of 15 per cent. on the old shares and 7½ per cent. on the new capital.

The directors of the *Dr. Paul Meyer Company*, of Berlin, report a loss of 508,000 marks for 1924, which is partly covered by the reserve fund. The demand during the year was small, and it was impossible to get remunerative orders; it was found necessary to accept orders at unfavourable prices so as in some measure to keep the works in operation and maintain connections.

The report of *Garbe, Lahmeyer and Company*, of Aix-la-Chapelle, states that ruthless competition prevailed in 1924-25 so that the sale prices did not cover the costs of production. Efforts, however, were made to simplify manufacturing in order to cheapen the prime costs. After having made provision for depreciation the accounts show a loss of 521,000 marks, which has been carried forward.

The *Transradio Company for Transmarine Communication*, of Berlin, reports that the course of business in the current year is favourable, particularly with Argentina. Communication with the East Indies (Java) has recently been opened, while next year the large station in Rio de Janeiro will be inaugurated for traffic with Brazil. In these circumstances it is assumed that a satisfactory dividend may be reckoned upon.

Direct West India Cable Co., Ltd.—The net result of the past year's working was a credit balance of £12,233, as against £11,249 in 1923-24. To this is added £28,026 brought forward, making £40,259, and the deduction of the interim dividend and repair expenses leaves £24,537. It is proposed to pay a final dividend of 5 per cent., free of tax, making 10 per cent. (tax-free) for the year, and to carry forward £21,537. There were four interruptions in the company's cables during the year, but they should now be free from further interruption for a considerable time.

American Water Works and Electric Co.—It is proposed to form a new company under the title of the West Penn Electric Co. to consolidate the electrical subsidiaries of this company. The new company will acquire the preferred and common stock of the West Penn Co. and the common stocks of the Potomac Edison Co. and the Keystone Power and Light Co. The capital will consist of 500,000 first preferred $100 shares, 59,258 "Class A" shares, 165,742 "Class B" shares, and 1,000,000 common shares of no par value.

Chadburn's (Ship) Telegraph Co., Ltd.—The report for the past year shows a loss of £1,375, as compared with profits of £1,202 in 1923-24 and £7,454 in 1922-23. The directors state that they are unable to recommend an ordinary dividend. The preference dividend is paid from the balance brought forward, and £1,445 is carried to the next account.

Sir W. G. Armstrong, Whitworth & Co., Ltd.—In a circular to the shareholders, the directors state that as the cash requirements of the company have been heavy, it is necessary to conserve the cash resources. Accordingly, it has been decided to pay no interim dividends in respect of the current year, except on the first cumulative preference shares.

Stock Exchange Notice.—Dealings in the following have been specially allowed by the Committee under Rule 159:—

Shropshire, Worcestershire and Staffordshire Electric Power.—7,830 six per cent. cumulative preference shares of £1 each, fully paid, Nos. 1,127,376 to 1,135,205.

Adelaide Electric Supply Co., Ltd.—In August 250,000 eight per cent. preferred ordinary shares of £1 each were issued to existing ordinary and preferred shareholders in the proportion of one new share for each three held.

Consolidated Gas, Electric Light & Power of Baltimore.—The dividend on the common stock has been raised to 62½ cents per share.

Shanghai Electric Construction Co., Ltd.—The directors have declared a first interim dividend of 3 per cent. (as against 6 per cent.).

Cuba Submarine Telegraph Co., Ltd.—A dividend at the rate of 5 per cent., free of tax, has been declared in respect of the first half of the current year.

Stocks and Shares.

MONDAY EVENING.

ANYONE who has had practical experience of the working of a rubber boom will understand the physical and mental strain imposed upon those Stock Exchange members who happen to be thrown into the midst of the vortex which courtesy still dignifies by the name of "market." Other matters have to be hastily pushed on one side. The human machine goes on working as long as it can. The market in the Stock Exchange resembles, in a *coup d'œil* from the roof of the House, a closely-wedged mass of animated corks, hundreds of heads bobbing up and down excitedly upon the unceasing maelstrom of the whirl of the boom. Other markets are relegated to the background of public interest. Changes in our this week's price-list testify, by their unimportance, to the neglect with which clients are regarding aught but the popular shares of the moment.

Districts fell 2½ points last Friday, to 40 middle, a price which brought in the speculative buyer, whose purchases served to rally the quotation to 41½. At the latter figure, the stock returns 8½ per cent. on the money, on the basis of the 1924 dividend of 3½ per cent. Metropolitans weakened to 64½, and Underground £10 shares to 2½. The less familiar London Electric Railway ordinary stock changed hands at 41 a few days ago, and this is a cheap-looking stock, whose main disadvantage lies in its unmarketability.

In electricity supply shares, Kensingtons have again put on 5s., which makes the price 12½. Except for this, no alteration has occurred amongst the London group of shares. Electric Supply Corporation ordinary have recovered their dividend. So have Whitehall preference. Clyde Valley shares eased off to 28s. 6d.

The Power & Traction Finance Company has received an important contract for electrical power works projected in Greece. It is thought that the financing may be undertaken under the provisions of the Trade Facilities Act.

Wireless shares exhibit a fair degree of liveliness, Canadian Marconis being the chief centre of attention. Curiosity is agog as to what may be the true inwardness of a demand which originated in Canada. A well-known Stock Exchange jobber, closely identified with wireless interests, sailed last week for Montreal upon a mission said to be connected with reasons other than those of health and pleasure. The price of the shares is 6s. 4½d. middle, and the parent Marconis hold their advance at 28s. 9d.

Cable stocks incline to dulness. Anglo-American preferred and deferred are both a little lower. The Eastern division is steady. Halifax and Bermuda has declared a tax-free dividend of 5 per cent., making 10 per cent. for the year. Direct West India ordinary shares are to receive the same, which also makes 10 per cent. for the full twelve months. Similar dividends were paid, in both cases, for the previous year. Chadburn's (Ship) Telegraph reports a loss of £1,375, and, in making the announcement, the directors express their regret that for the first time in the history of the company, they cannot recommend a dividend on the ordinary shares. Last year the latter received 3 per cent., and in the previous half-decade, their dividend was 6 per cent. per annum. The preference dividend has been duly met. The ordinary shares stand nominally at 10s.; shares last changed hands at 7s. 6d., on September 24th. No dealings are officially recorded in the 6 per cent. preference since July 1st, when a bargain was marked at 13s. 9d.

Southern Brazil Electric 6 per cent. bonds have put on several points at 54, but Brazilian Tractions reacted to 74. In Mexicans, the movements are somewhat mixed, as usual, Mexico Tramways Fives being better at 73½, Mexican Light and Power issues going back. Rumours suggest that the revolutionary spirit still smoulders amongst some of the banditti in that distressful country. British Electric Traction stocks retain their substantial rises.

Edisons are a few pence lower at 8s. 9d. Cable construction descriptions are unaltered on the week, the rubber activity having no further effect. Automatic Telephones remain at 47s. 6d. International Automatics are quiet at 28s. 6d. Iron and steel shares gave way upon the decision of the Armstrong-Whitworth board to postpone payment of the interim dividends on the company's junior preference shares. Babcocks remain at 2½, but the market as a whole is disturbed and uneasy at this latest manifestation of the unsatisfactory condition of trade in the "heavy" industries.

Share List of Electrical Companies

	Nom. £	Dividend. 1923	1924	Price Sept. 18, 1925	Rise or fall.	Yield p.c.
Home Electricity Companies						
Bournemouth and Poole	1	13	14	3	—	4 13 4
Brompton Ordinary	1	10	10	1⅝	—	*5 14 3
Charing Cross Ordinary	1	14½	15	10/-	—	6 2 5
do. do. 4½ Pref	1	4½	4½	17/-	—	5 6 0
Chelsea	1	12	12	1⅝	—	6 8 0
City of London	1	15	15	48/3	—	6 4 4
do. do. 6% Pref	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	28/6	—6d.	5 12 4
County of London	1	15	15	57/-	—	5 5 8
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	1	7	7	22/-	—	6 7 3
do. 7% Pref.	1	6	7	21/6	—	6 10 3
Elec. Supply Corporation	1	10	10	31/3xd	+ 3/0	6 8 0
Kensington Ordinary	5	14	15	12⅝	+ ½	5 16 8
Lancs. Light and Power	1	7½	7½	26/-	—	5 15 5
London Electric	1	10	10	34/-	—	5 17 8
do. do. 6% Pref.	5	6	6	8½	—	5 7 10
Metropolitan	1	10	11	39/6	—	5 11 4
do. 4½% Pref.	1	4½	4½	17/-	—	5 5 11
Midland Counties	1	5½	6	22/9	—	5 5 6
Newcastle-on-Tyne Ordinary	1	6	7	1⅛xd	—	6 4 5
do. 5% Pref.	1	5	5	18/5 xd	6d.	5 6 8
do. 7% Pref.	1	7	7	24/6xd	—	5 14 3
Notting Hill 6% Pref.	10	6	6	5½	—	6 6 4
North Met. Elec. 6% Pref.	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	5	17½	17½	14⅝	—	6 1 9
South London	1	15	15	2½	—	6 0
South Metropolitan Pref.	1	7	7	1⅛	—	5 12 0
Urban Ordinary	1	4	4	18/3	—	4 7 8
do. 6% Pref.	1	6	6	19/6	—	6 3 1
Westminster Ordinary	1	15	15	44/-	—	6 16 4
Whitehall Elec. Invst. 7½% Pref	1	7½	7½	1xd	+ 1/32	7 10 0
Yorkshire Elec.	1	8	8	29/6	—	5 8 6
Home Rails.						
Central London Ord. Assented Stock	4	4		66	—	£ 1 3
Metropolitan	4	5		64½	—1½	7 16 0
do. District	3½	3½		41⅛	—1	8 10 9
Underground Electric Ordinary	10	Nil	Nil	2⅛	—	Nil
do. do. "A"	1/-	Nil	Nil	6/8	—	Nil
do. do. Income Bonds	6	6		95	—	*6 6 4
Telegraphs and Telephones.						
Anglo-Am. Tel. Pref. Stock	6	6		102½	- 1	5 17 1
do. Def.	1½	1½		23⅝	½	6 6 4
Automatic Telephone	1	8	6	47/6	—	2 10 7
Chili Telephone	5	6	5	5½	—	¼ *4 11 0
Cuba Sub. Ord.	10	5	5	6¼xd	—	½ 8 0 0
Eastern Extension	10	10	10	17⅛	—	*5 15 11
Eastern Tel. Ord.	Stock	10	10	171½	—	*5 16 7
Globe Tel. and T. Ord.	10	10	10	17⅝xd	+ ⅛	*5 13 4
do. do. Pref.	10	6	6	10⅞	—	5 10 4
Great Northern Tel.	10	22	22	32½	—	6 15 4
Indo-European	25	7	8½	42½	—	*5 2 5
Marconi	1	10	10	1⅞	—	6 19 2
Marconi Marine	1	10	7½	⅞	—	8 11 6
Oriental Telephone Ord.	1	12	12	2⅛	—	*5 16 4
United R. Plate Tel.	5	8	8	7⅛	—	¼ 5 6 8
Western Telegraph	10	10	10	16⅛xd	—	¼ *6 4 0
Home and Foreign Trams &c.						
Anglo-Arg. Trams First Pref.	5	5½	5½	3⅞	—	8 3 0
do. do. 2nd Pref.	5	6	6	2⅜	—	8 17 10
do. do. 5% Deb. Stock	5	5		7⅛	—	6 10 9
British Electric Traction Ord.	6	6		120	—	5 0 0
do. do. 6% Pref.	6	6		107	—	5 12 2
Brazil Traction	100	4	4	74	—1	5 8 1
Brit. Columbia Elec. Rly. Pcc. Stock	5	5		87½	—1	5 14 3
do. do. Preferred	96/-	96/-		89½	—	*5 6 5
do. do. Deferred	129/3	129/3		109½	—	*5 18 3
do. do. Deb.	4½	4½		76½	—	5 11 1
Lond. & Sub. Trac. 5% Pref.	1	2½	Nil	4/6	—	Nil
London United Tram. Deb. Stock	4	4		42½	—	9 8 4
Mexico Trams, 5% Bonds	—	5	5	63½	+1	7 17 6
Mexican Light Common	100	Nil	Nil	33	+1	Nil
do. Pref.	100	Nil	Nil	4	—1	Nil
do. 1st Bonds	—	5	5	73½	- 1½	6 16 1
Yorkshire (West Riding)	1	5	—	16/9	—	5 6 8
Manufacturing Companies						
Babcock & Wilcox	1	12	12	2½	—	*4 16 0
British Aluminium Ord.	1	5	10	34/6xd	+6d.	5 16 0
British Elec. Transformer Pref.	1	Nil	7	1	—	...
British Insulated Ord.	1	15	15	3⅞xd	—	4 12 4
Brush Ord.	1	10	10	1⅛	—	8 17 10
Callenders	1	15	15	3⅛	—	4 12 4
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	⅜	—	... ...
Edison-Swan	4/-	10	10	8/9	—3d.	4 11 4
do. 5% Deb.	Stock	5	5	80½	—	6 4 3
Electric Construction	1	10	10	32/-	—	6 5 0
Enfield Cable, Pref.	1	7½	7½	1½	-	6 0 0
English Electric	1	5	5	18/3	—	5 9 8
do. do. Pref.	1	6	6	20/-xd	-	5 17 1
Gen. Elec. Pref.	1	6½	6½	23/9	—	5 9 5
do. Ord.	1	5	7½	27/-	—	5 11 1
Henley	1	15	16	3⅛	—	4 18 6
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	5	5	1⅛	—	*4 14 1
Johnson & Phillips	1	10	10	48/9	—	4 2 0
Met-Vickers, Ord.	1	8	8	94/4	—	6 10 8
do. Pref.	2	8	8	2⅜	—	6 14 9
Siemens Ord.	1	—	7½	29/3	—9d.	5 4 4
Telegraph Construction	12	20	20	26½	—	4 10 0

* Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances.

CHEMICALS, &c.	Price September 29th.	Fortnight's Inc. or dec
a Acid, Oxalic	6¾d	
a Ammoniac, Sal	£60	
a Ammonia, Muriate (large crystal)	£52	
a Bisulphide of Carbon		
a Borax	£25	
a Copper Sulphate	£25 10s	
a Potash, Chlorate	4d. to 4½d	
a ,, Perchlorate	5½d.	
a Shellac	£15 15s	
a Sulphur, Commercial	£7 15s.	
a ,, Roll	£7 15s	
a Soda, Chlorate	3½d. to 3¾d.	
a ,, Crystals	£5 to £5 5s	
a Sodium Bichromate, casks	4d	
METALS, &c.		
b Aluminium, Ingots	£120 to £125	
b ,, Wire	1/9 to 2/6*	
b ,, Sheet	1/6 to 2/-	
p Babbitt's Metal and Anti-friction Metal—		
Grade I	£229	
Grade II	£164	
Grade III	£95	
c Brass (rolled metal 2" to 12" basis)	9¼d.	
c ,, Tubes (solid drawn)	1/- to 1/0½	
c ,, Wire, basis	10¼d	
c Copper Tubes (solid drawn)	1/1½	
c ,, Bars (best selected)	£92	£1 dec.
c ,, Sheet	£92	£1 dec.
c ,, Rod	£92	£1 dec.
d ,, (Electrolytic) Bars	£67 10s.	25/- dec.
d ,, ,, Sheets	£148 10s	25s. dec.
d ,, ,, Wire Rods	£77 10s.	12½d. dec.
d ,, ,, H.C. Wire	9⅛d.	
f Ebonite Rod	2/3 to 2/4	
f ,, Sheet	2 3 to 2/8	
n German Silver Wire	2/8	
h Gutta-percha, fine	3/9	
h India-rubber, Para fine	3/0½	½d. inc.
l Iron Pig (Cleveland Warrants)	nom.	
l ,, Wire, galv. No. 8, P.O. qual.	£21	
g Lead, English Pig	£40 10s.	15s. inc.
g Mercury	£13 to £13 5s.	7/6 to 10/- dec
e Mica (in original cases) small	8d. to 3/-	
e ,, ,, medium	4/- to 8/-	
e ,, ,, large	10/- to 20/- & up.	
p Phosphor Bronze, plain castings	1/3½	
p ,, ,, drawn bars & rods	1/3	
p ,, ,, rolled strip & sheet	1/2½	
p ,, ,, wire	1/3½	
o Platinum	£2o	
d Silicium Bronze Wire	1/0½	
r Steel, Magnet, in bars	7½d.	
m Tin, Block (English)	£265 to £265 5s.	£13 5s. inc.
n ,, Wire, Nos. 1 to 16	3/11	

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd
c Thos. Bolton & Sons, Ltd
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha & Telegraph Works Co., Ltd.
g James & Shakespeare
h Edward Till & Co
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
m P. Ormiston & Sons.
n Johnson, Matthey & Co. Ltd.
o C. Clifford & Son, Ltd.
r W. F. Denn's & Co.

Proposed Manchester Tube.—A new proposal to deal with the traffic problems of Manchester by means of an underground railway was put forward by Ald. Bowie at a meeting of the North-Western Section of the Institute of Transport on September 25th. The suggestion was that an inner ring should be constructed with a central station in Piccadilly, and that from this the outside areas should be served by a number of branches. The population was large enough to justify the scheme, for it was about the same as that of central London when the first tubes were constructed there—some three millions within a radius of 12 miles from the centre of the city. The speaker said that the cost was estimated at between £250,000 and £300,000 per mile, the geological formation being favourable to construction.

High-voltage Submarine Cable.—Since 1914 the North Sealand (Denmark) Electricity Co. has received a supply of energy from the Swedish hydro-electric works at Lagan, in Halland, through a submarine cable at 25,000 volts, which is laid under the Sound. It was decided some time ago that the pressure should be raised to 50,000 volts, but it was only this year that definite work in the direction of the execution of the scheme was decided on by the electricity company by the establishment of a 50,000-volt line between Sweden and Copenhagen. This has now been carried out in connection with the Southern Swedish Power Co., of Malmo, the town of Fredriksberg, and the city of Copenhagen, which in combination have participated in the total expenditure, which amounts to over 2,000,000 kr. The cable, which is of the three-phase type, has been supplied by a German firm, is 2.89 miles long, and was made in six lengths. The laying of the cable took place between June 28th and July 22nd, and the land-line extension to Copenhagen was then proceeded with.

The Institution of Public Lighting Engineers.

Annual Conference at Leeds.

(*Continued from page* 516.)

On Tuesday, September 15th, the visitors were the guests of the Leeds Gas Committee at luncheon at Leeds Town Hall, where Alderman George Ratcliffe, J.P., chairman of the Gas Committee, presided over a very large gathering.

The toast of "The City of Leeds" was proposed by Sir Albert Ball, of Nottingham. The Lord Mayor of Leeds (Councillor C. G. Gibson) responding, claimed that the Electricity Department was second to none in Yorkshire. In it there was no unit of plant which was older than 1913, and in all they had nearly 100,000 h.p. there. They had also a tramway with about 120 miles of single line and contributed nearly £90,000 to the relief of the rates. Alderman Charles Lupton, responding as chairman of the Leeds Housing, Sites, and Improvements Committee, spoke of the great importance of the relative values of gas and electricity in the new housing schemes and in the lighting of the roads serving those houses. When he needed absolutely impartial guidance he sought help from the Fuel Research Department of the Leeds University, which was doing valuable work. Councillor John Arnott (Lord Mayor-elect of Leeds) also responded.

Alderman George Ratcliffe, J.P., chairman of the Leeds Gas Committee, in giving the toast of "The Institution of Public Lighting Engineers," congratulated Mr. Shapley on his new honour, and said that in Leeds the electrical and gas departments worked in complete harmony in the public lighting interest. Mr. Shapley, responding, thanked the members of the Lighting and Gas Committees for the facilities granted to the Conference, and the Corporation generally, for its approval and support. Mr. S. B. Langlands, ex-president of the Institution, also responding, said there could be no finality in street lighting, and they must go on from brightness to brightness.

Councillor E. J. Clarke, chairman of the Leeds Lighting Committee, briefly proposed "The Guests," and Alderman J. H. Waddington, Mayor of Halifax, for many years chairman of the Halifax Gas Committee and vice-chairman during his mayoralty, responding, said that, although he was primarily a gas man, he rather regretted that so much had been said of gas at that function and so little of electricity. In all fairness they had to recognise that the future of lighting in their cities, towns, and villages, both in the streets and in the buildings, must to a great extent be left to the electrical side of lighting service. To his mind, as a strong enthusiast for gas, there was no competition to-day with electricity for lighting. On the other hand, when it came to heating, and some aspects of power, he contended that gas held a wonderful first place.

Alderman W. Wilkie, J.P., chairman of the Newcastle-on-Tyne Lighting Committee, said he had come with Councillor Oates, the Lord Mayor-elect of Newcastle, to invite the Institution to hold its next Conference at Newcastle.

On the resumption of the conference on the morning of September 16th, the delegation from Newcastle formally extended its invitation to that city, which was accepted with thanks.

Mr. Edward C. Lennox, of the Durham County Electrical Supply Co., then threw on the lantern screen a number of views illustrating points in his paper on "Electric Street Lighting in Rural Areas," and the paper was discussed.

Mr. J. S. Thomas, D.Sc., submitted a paper contributed by the Distribution Department of the South Metropolitan Gas Co., and illustrated by a considerable number of lantern views. A discussion followed.

As a result of the election of officers and Council, the following was announced by the secretary as the list of new officers of the Institution:—President, Mr. C. S. Shapley, Leeds; vice-president and president-elect, Mr. R. Davison, Newcastle-on-Tyne; hon. treasurer, Mr. E. M. Severn, London; hon. secretary, Mr. W. J. Liberty, City of London; editor, Mr. E. J. Stewart, Glasgow.

Thanks were accorded to the Lord Mayor and the Lighting and Gas Committees of Leeds for their hospitality; to the president; to the retiring officers and Council; and to the authors and readers of the papers

Presidential Address.

By C. S. SHAPLEY.

(*Abstract.*)

The lay-out of Leeds is difficult from a street-lighting standpoint. The industrial portion is very congested, while the population about two miles from the centre becomes sparse. There are fifteen main arterial roads radiating from the centre; and there are many important roads connecting these arterial roads, which are also very sparsely populated.

We employ in the centre of the city an electric controller which combines three operations in one clock—namely, lighting, checking, and extinguishing. Six of these are in use, controlling 53 lamps, varying in wattage from 300 to 1,000. There are also 58 controllers of the on-and-off type operating 258 lamps, varying from 200 to 300 watts—making the total number of lamps controlled by time switch 303. The remaining 413 lamps are hand-operated from 53 switch boxes.

A tower motor derrick is kept for general use, and this is at call at any hour for breakdowns. For general maintenance, four hand derricks, each serving 174 lanterns, are employed, and two men per derrick are responsible for the work.

All steel suspension wires and overhead work are examined annually. Steel cables are put to severe test, and coated with a mixture of graphite and vaseline, care being taken that the whole of the wire is coated.

The city is divided into five districts, each controlled by an inspector, who is required to be on his district at lighting and extinguishing time. He patrols one run a week with a lighter, is responsible for the efficient lighting of his district, the supervision of repairs, and the pruning of trees, and has to report on alternate days to the head of the Department. One male and one female clerk, and part-time assistants from the Gas Department, do all the clerical work.

In the choice of lighting, level or uniform density of ground illumination is generally accepted as the ideal. On the other hand, what I should term bright-spot illumination has its supporters; and a strong argument advanced in favour of the latter method of illumination, as compared with level illumination is the pleasing and decorative effect obtained. Added to this is the definite and stimulating influence a bright source of light has on the user of the road. With level illumination, these important factors are very much less pronounced. The lighting may appear monotonous, lacking in contrasts, and rather gloomy. This comparison is probably more noticeable where the light sources for each system are of equal candle power, and the method of obtaining level illumination is by directional light beams obtained by the use of refractors.

I had some experiments carried out in order to compare the lighting of one of our main thoroughfares, when using bright-spot illumination and level-ground illumination obtained by directional beam lighting; and, frankly, I was disappointed with the results of the latter. In this particular case the greater portion of the re-directed light beams was wasted. There was a brilliant band of illumination half-way up the buildings on both sides of the road. The system of illumination by directional light beams was tested on the photometer bar; the curves of the test are shown in fig. 1. The curves 2, 3, 4 and 5, are of lamps fitted with refractors, and curve 1 of a lamp without that device. The ground illumination curve of the lamp with and without the refractor shows graphically that the increase of illumination half-way between the lamps does not compensate for the loss below the lamps. The loss is explained by the concentrated light beams near the horizontal (which are only useful in two directions for street illumination) being made to radiate in all directions. For lighting thoroughfares where the distances between the lamps are necessarily great, one can foresee definite advantages associated with directional beam illumination.

I find it is sometimes an advantage in street lighting to sacrifice illumination for effect; and in Lower Briggate, some gas-filled clear lamps were replaced by opal lamps of the same candle power, with pleasing results. "Even" or "level" ground illumination was a big claim for the particular type of

lamps used; but in the street tests made this claim was not substantiated. The good results obtained from the opal lamps are, in my opinion, due to the bigger area of the source of light, which creates an impression of higher candle power, although it is actually less, as some of the light is absorbed by the opal globe. The lights are brilliant, but not glaring; and the intrinsic brilliancy per sq. in. of globe area is approximately 20 candles. Intensities below this would probably not be so effective. The loss in ground illumination compared with that obtained from a gasfilled clear lamp is comparatively small. The general lighting effect, judged by observation, and not by photometric methods, would appear to be superior to that obtained from gasfilled clear lamps of equal candle power.

With respect to the dazzle effect of bright sources of light, this is not a simple question of brilliance, but of contrasts, and depends chiefly on the observer. Personally, I have not experienced dazzle in the ordinary passing observation one gives to a street lamp, even with the highest candle power units. The loss of vision caused by dazzle (say) from the headlights of a motor-car, is due to the fact that the contrast between the brilliancy of the headlights and the surrounding illumination is too great. The same blinding effect is experienced on going from daylight into a darkened room, though the room may appear quite light when the eyes have become accustomed to the gloom. In this case it is the eyes which are unable to adapt themselves to the sudden contrast. In our street lighting the increase and decrease of illumination to and from lamps is not sufficiently contrasting to interfere seriously with vision, except in isolated places where buildings and obstructions cause deep shadows; and, speaking generally, I think that dazzle in street lighting is more imaginary than real.

The most suitable height at which to fix certain types of lamps in order to obtain the best results was a problem which arose in respect of some special street lighting which we were contemplating. We experimented with a 3-light and a 4-light lamp. The lamps were fixed on 12-ft. columns, and horizontal illumination tests were made at 3 ft. above ground level.

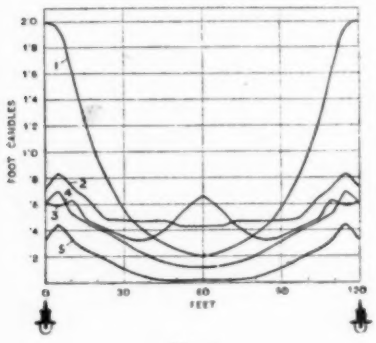


Fig. 1.

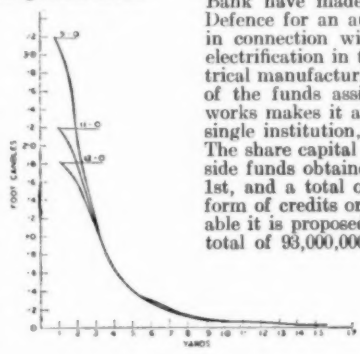


Fig. 2.

An interesting feature to be noted from the curve, fig. 2, is that the horizontal illumination with the 4-light lamp, except within very narrow limits from the base of the lamp, is practically the same for different heights of columns. From the point of view of horizontal illumination with lamps of the above type, the height, within limits, is apparently immaterial. Therefore, any decision in this respect would be influenced chiefly by a knowledge of the locality for which they were intended and considerations of visibility and interference with the line of vision.

In the testing of street lighting the usual standard of comparison is the horizontal illumination; but in my opinion this leaves much to be desired. Horizontal illumination is least influenced by reflected light from buildings and other objects in the vicinity of the lamp, which are factors of sufficient importance to have had some influence in the choosing of the lamp for that particular locality. Pedestrians and any objects in the road are seen chiefly by silhouette and by reflected light from a vertical plane, the reflected light from the horizontal plane playing a part, but not the most important part, in securing visibility. It will be recognised that gradients and the colour of the road surface influence illumination to a considerable extent, and consequently can be considered important factors in the scheme of lighting. In the method of taking horizontal illumination tests, these factors are ignored, the illumination being measured on a white card held in a horizontal position, which is not a true measure of the available illumination.

In taking illumination determinations, we use a lumeter, but its value is very limited, as readings below 0.01 foot-candle are not reliable, though at this illumination definite shadows are produced. In the Jackson Avenue tests observations could only be taken up to a distance of 14 yards from the base of the lamp. This left approximately 45 yards between the lamps where it was impossible to take a reading, though there was distinct illumination in that area; it would be interesting to know if there is an instrument reliable for readings below 0.01 foot-candle.

I think I have demonstrated that my leaning to a bright, cheerful source of light is justified. I would, however, emphasise that street lighting calls for common sense and initiative, in order to give service to the public, and to provide adequate lighting for personal safety—always having regard to economy.

The Exhibition.

An exhibition of lighting appliances was held in the great hall of the Leeds Town Hall throughout the period of the Conference, and was supplemented by sections of street lighting in the city which were allocated to various lamp and control manufacturers for the temporary use of their fittings as a practical demonstration of their worth in normal street lighting. The electrical exhibitors were: Siemens & English Electric Lamp Co., Ltd., showing weatherproof street lanterns, reflectors, anti-vibration disks, &c.; Venner Time Switches, Ltd., two principal types of electric time switches with fifteen-day or six-week clocks, according to size, and various types of housing to suit different local conditions; Foster Engineering Co., Ltd., electric lamps, &c.; General Electric Co., Ltd., electric lighting appliances; Photector Co., Ltd., the "Dia" long-burning flame arc lamp and the "Photector" street-lighting lanterns; Cable Accessories Co., Ltd., electric light fittings; Cryselco, Ltd., opal-type gasfilled electric lamps for street use; British Thomson-Houston Co., Ltd., lanterns as in use in Leeds streets, and "Mazda" lamps; Edison Swan Electric Co., Ltd., anti-vibration fitted electric street lanterns of various classes; Holophane, Ltd., street refractors, two- and four-way, ornamental and otherwise.

In addition to many makers of gas appliances, the following firms showed lighting accessories:—Charles Steel, glassware, paints, and varnishes; Wardle Engineering Co., lamps, globes, &c.; and Donald MacPherson & Co., Ltd., paints, varnishes, and enamels for lamp standards.

(To be continued.)

Russian Electrical Notes.

The Electrical Bank.—The directors of the Electrical Bank have made application to the Council of Labour and Defence for an augmentation of the capital of the Institution in connection with the growing importance of the work of electrification in the country, and the development of the electrical manufacturing industry. It is held that the insufficiency of the funds assigned through the budget for electrification works makes it advisable for these funds to be entrusted to a single institution, and not divided among the different banks. The share capital of the bank is 8,000,000 roubles, and the outside funds obtained amounted to 35,000,000 roubles on August 1st, and a total of 34,000,000 roubles has been granted in the form of credits or loans. If the necessary funds become available it is proposed, in 1925-26, to grant credits and loans for a total of 93,000,000 roubles, of which 12,000,000 roubles would be for the re-equipment of the manufacturing industry, 10,000,000 roubles for rural electrification, 12,000,000 roubles for local electrical construction works, and 15,000,000 roubles for initial works in connection with the erection of new regional stations. Moreover, the bank is faced with the question of financing the importation of electrical manufactures from abroad as the Soviet manufacturing industry does not develop as rapidly as the growth in the demand for electrical goods.

The Weak-Current Trust.—This Trust, whose chief manufactures are telephone and radio apparatus, has brought forward its productive programme for the year beginning on October 1st. The gross output will amount to 16,300,000 (pre-war) roubles, showing an increase of 94 per cent. over 1924-25. Telephone and telegraph apparatus will be turned out to the same extent as in the expiring year, while the output of measuring apparatus is to be increased by 50 per cent., and that of meters by 180 per cent. As the production outlined will be 40 per cent. in excess of the capacity of the works, it is intended to overcome the deficiency by carrying out extensions and the provision of new equipment, which will necessitate the expenditure of 4,300,000 roubles. The working capital will also be insufficient, and a grant of 4,422,000 roubles is asked for by the trust. It is intended to increase the number of persons employed by 71 per cent. to 8,270, and the average wages will be raised by 10 per cent., while the costs of production are expected to be reduced by 8 per cent.

The Electrical Market.—The condition of the electrical market at the beginning of September is stated to have been very animated. A large demand prevailed for stock manufactures and those for delivery in the near future until the close of the building trades season. Cables were in good request, particularly for State industries, as also were copper wire, conductors, flexible cords and other installation materials, while the calls for the supply of lamps were being filled generally by home production. Motors were in great demand, especially sizes up to 40 h.p., and second-hand motors repaired in the shops were being sold at slightly above pre-war prices. The products are being offered principally by the trusts, the part played by other trading organisations in the matter last year having now been greatly reduced, and private firms now only occupy an inconsiderable position in the market.

Electricity Supply in Leningrad.—The programme of the Elektrotok (the Electricity Supply Undertaking at Leningrad) provides for an output of 260,000,000 kWh in 1925-26, or an increase of 35 per cent. over the current year's production. It is proposed to receive 20,000,000 kWh from the Volkhoff station, and a beginning is to be made with the construction of the new peat fuel station, and the erection of a new 10,000-

kW turbo-generator at the Krasnaya Oktyabr station. Altogether it is proposed to expend 7,689,000 roubles on constructional works next year, and in order to complete the programme a loan of 4,000,000 roubles will have to be granted to the Elektrotok.

The Ukraine.—The committee dealing with the electrification of the Ukraine has approved a report deciding that the local electrical committee in the Ukraine should be wound up and be replaced by a district Electric Planning Commission, and that the General Electric Commission should provide the funds for the maintenance of such a commission for that republic.

The Schatur Station.—The inauguration of this station, which is to employ peat as fuel is expected to take place shortly, when the second generating set will be put into operation. Besides making an addition to the supply of Moscow and region, the new works will furnish energy to a number of industrial works. The existing temporary plant will then be shut down, and transferred to the Lyapinsk station now under construction near Yaroslav. The stocks of peat accumulated at the Schatur station amount to 321,000 tons, and will ensure an adequate fuel supply for one year.

Funds for Communal Power Stations.—The National Commissariat of Finance has confirmed an application made by the Central Bank for Housing and Communal Construction for the handing over to the bank of the funds assigned in the State budget for the construction of communal power stations. In 1925-26 it is proposed to finance local stations by the grant of loans for a fixed period of not more than five years at the rate of 6 per cent., of which 5 per cent. would be allotted to the State, and the remaining one per cent. to the bank.

Accumulator Production.—The North-Western Industrial Bureau has confirmed the productive programme of the Accumulator Trust for the year beginning with October 1st. It is proposed to increase the output by 52 per cent. over the current year's production, while batteries for railway purposes only will be augmented by 185 per cent.

Electrical Exports of the United States.

BELOW are shown the values of electrical machinery and apparatus exported from the United States during the twelve months ended June last. Comparative figures for the twelve months ended June, 1924, are added and notes of increases or decreases also given.

	Twelve months ended June, 1924. Value. $	June, 1925. Value. $	Inc. or dec. $
Electrical machinery and apparatus (total)	68,800,000	66,871,000	−1,929,000
Generators—			
Direct current—			
Under 500 kW	939,000	876,000	− 63,000
500 kW and over... ...	704,000	551,000	− 153,000
Alternating current—			
Under 2,000 kVA ...	146,000	219,000	+ 73,000
2,000 kVA and over ...	1,195,000	1,115,000	− 80,000
Steam turbine generator sets	10,000	429,000	+ 419,000
Accessories and parts for generators	1,321,000	1,079,000	− 242,000
Self-contained lighting outfits	652,000	879,000	+ 227,000
Batteries—			
Flashlight batteries ...	476,000	1,065,000	+ 589,000
Other primary batteries ...	989,000	941,000	− 48,000
Storage batteries	2,686,000	2,661,000	− 25,000
Transforming or converting apparatus—			
Power transformers ...	3,937,000	2,086,000	−1,851,000
Other transformers ...	1,981,000	1,525,000	− 456,000
Rectifiers, double-current and motor generators, dynamotors, synchronous, and other converters	1,076,000	1,110,000	+ 34,000
Transmission and distribution apparatus—			
Switchboard panels, except telephone	2,069,000	2,018,000	− 51,000
Switches and circuit breakers over 10 amps....	2,138,000	1,835,000	− 303,000
Fuses and fuse blocks ...	333,000	284,000	− 49,000
Watt-hours and other measuring meters	659,000	486,000	− 173,000
Volt, watt and ampere-meters, and other recording, indicating and testing apparatus ...	1,204,000	1,565,000	+ 361,000
Lightning arresters, choke coils, reactors, and other protective devices ...	918,000	646,000	− 272,000
Motors, starters, and controllers—			
Motors under 1 h.p. ...	1,683,000	1,703,000	+ 20,000
Stationary motors—			
1 to 200 h.p.	3,155,000	1,957,000	−1,198,000
Over 200 h.p.	936,000	443,000	− 493,000
Railway motors	1,483,000	825,000	− 658,000
Electric locomotives—			
Railway	1,956,000	1,210,000	− 746,000
Mining and industrial ...	345,000	240,000	− 105,000
Other motors	†120,000	—	—
Starting and controlling equipment	†991,000	—	—
For industrial motors ...	*877,000	1,101,000	—
For electric railway and vehicle motors ...	*83,000	141,000	—
Accessories and parts for motors	2,086,000	1,776,000	− 310,000
Electrical appliances—			
Electric fans	1,109,000	812,000	− 297,000
Electric lamps—			
Metal filament	1,101,000	1,135,000‡	+ 34,000
Other electric lamps ...	331,000	335,000	+ 4,000
Flashlights	629,000	1,056,000	+ 427,000
Searchlights and projectors	404,000	431,000	+ 27,000
Motor-driven household devices	889,000	1,040,000	+ 151,000
Domestic heating and cooking devices	1,055,000	1,231,000	+ 176,000
Industrial electric furnaces and ovens	269,000	225,000	− 44,000
Therapeutic apparatus, X-ray apparatus, galvanic and faradic batteries, &c.	989,000	1,192,000	+ 203,000
Signal and communication devices—			
Radio apparatus	4,062,000	8,273,000	+4,211,000
Telegraph apparatus ...	446,000	553,000	+ 107,000
Telephone apparatus—			
Magneto telephones ...	191,000	173,000	− 18,000
Other telephones ...	657,000	400,000	− 257,000
Telephone switchboards	936,000	987,000	+ 51,000
Other telephone equipment	1,059,000	2,440,000	+1,381,000
Railway signals, switches, and attachments	1,028,000	920,000	− 108,000
Bells, buzzers, annunciators and alarms	126,000	171,000	+ 45,000
Other electrical apparatus—			
Spark plugs, magnetos, and other ignition apparatus	2,127,000	2,247,000	+ 120,000
Insulating material ...	1,591,000	1,440,000	− 151,000
Metal conduit, outlet, and switch boxes	547,000	655,000	+ 108,000
Sockets, receptacles and lighting switches ...	1,184,000	1,353,000	+ 169,000
Electric lighting fixtures, interior and street ...	321,000	990,000	+ 669,000
Other wiring supplies and line material	1,629,000	1,011,000	− 618,000
Electrical apparatus n.e.i.	8,973,000	7,036,000	−1,937,000

* January 1st—June 30th. † July 1st—December 31st.

‡ Electric lamp exports were distributed as follows:—Europe, $38,000; Canada, $37,000; Central America, $83,000; Mexico, $223,000; British West Indies, $22,000; Cuba, $203,000; Argentina, $93,000; Brazil, $26,000; Chile, $52,000; other South American Countries, $75,000; Australia, $129,000; New Zealand, $20,000; British South Africa, $33,000; other countries, $99,000.

Electric Heating "Mystery."—According to the *Electrical World*, the greatest stumbling block in the way of more rapid progress in the application of electric heating is the reluctance of manufacturers and users of the apparatus to publish details. "There is a tendency on the part of many heating engineers to throw a cloak of mystery about the methods used and the results obtained with industrial electric heating. When selling appliances to the user the impression is created that a special secret process has been evolved for his sole purpose. True, most electric heating jobs require special treatment and apparatus, but after the installation has been made the user is more inclined to tell about the improvements he has effected than is the engineer or manufacturer who designed and built the equipment. . . . Specialists who withhold data or harbour the belief that they possess certain trade secrets hamper the growth of the business by creating doubt of the merits of a process about which there appears such a dearth of accurate information."

The Municipal Tramways Association.—III.

Annual Conference at Brighton.

Tramway Finance: Capital Outlay: Application of Surplus Revenue.

By Alderman R. A. Smithson, J.P. F.C.A.

(*Abstract.*)

Since 1918-19 great changes have occurred. The capital expended by local authorities on tramways has increased by £14,824,535, or 26.23 per cent.; the revenue by £5,823,555, or 32.35 per cent.; and the working expenses by £5,384,857, or 40.89 per cent. The revenue per route mile has advanced from £10,870 to £12,954, or by 19 per cent. The effects of the war on the growth of revenue, due to increased fares, and in the working expenses, owing in a large measure to increased wages, are thrown into prominence. The revenue is now more than double what it was in 1912-13, whilst the route miles have increased by less than 18 per cent. On the other hand, the working expenses have increased by 172 per cent. The change in the financial policy and circumstances of local authorities is shown by the fact that while in 1912-13 tramways were assisted by the rates to the extent of £64,988, and contributed in rate-aid £519,715, in 1923-24 they received from local taxation £256,777, and contributed in reduction of it £280,537. In the year 1924-25 34 local authorities raised in rates for tramways the sum of £425,217 (of which seven authorities provided £339,704), and 22 local authorities derived £269,952 in reduction of rates. The amount paid for rates between 1912-13 and 1923-24 increased from £458,317 to £879,980, of which 75 to 80 per cent. was paid in respect of the permanent way. One striking feature is the amount placed to reserve and depreciation funds. It increased from £733,749 to £1,688,405. The total amount set aside in these funds during the last six years was no less than £8,063,132, while the whole sum applied in debt redemption or transferred into sinking funds for that purpose was £9,883,122.

In relation to capital, local authorities differ fundamentally in their financial arrangements from companies. The former must redeem their loan indebtedness, and at the same time maintain their undertakings in an efficient condition. They have thus a burden cast upon them which companies (that as a rule cannot redeem much of their capital) do not have to bear. A municipality may both restore and acquire its capital by the simultaneous operation of renewals and redemption funds. Only in exceptional cases, such as the construction of waterworks or large electricity stations, are they allowed to postpone the commencement of redemption funds. I find that of the total outlay on tramways, £28,653,200 has been spent on the permanent way; £11,029,308 on cars; £6,040,284 on electrical equipment of line; and £3,564,011 on street improvements.

Parliament commonly granted in previous years 30 years for the repayment of permanent way debt, 15 years for cars, and 20 years for the overhead equipment, giving an average (having regard to the amount of expenditure shown above) of 25 years, the shorter period in respect of cars compensating somewhat for the excessively long period applicable to permanent way. Speaking generally, it cannot be said that the loan period is unduly extended in the case of electrical equipment of line. Experience goes to prove that the effective life thereof is in excess of this period. As to tramcars, I am reminded that in Leeds tramcars were purchased by us in 1897, and again in 1900. These cars are now undoubtedly due for replacement. It may be that the effective life-period of this asset has been over-reached, and I may say that replacements would certainly have been effected before this date but for the war and the very high prices ruling thereafter. Respecting permanent way, it is painfully common knowledge that 30 years in respect of all routes over some of which heavy services are run is excessive; 12 or 15 years in these days of much heavier vehicular traffic would be nearer the mark. But it is true that there must be quite a substantial portion of tramway tracks where a 25-years loan period would be quite suitable. 30 years, which is the period according to the usual practice, is therefore too long, if regard is to be paid only to the question of the life of the asset.

Tramway undertakings may, I think, quite legitimately contemplate the replacement of worn-out assets by charging such replacements to capital account, but I accompany this remark with a strong proviso that before fresh borrowings are indulged in for replacements, the old debt in respect of such assets should be entirely repaid. In my view no serious objection can be raised to this procedure, and I may say that in Leeds we are replacing 200 tramcars on this basis. If this method should be applied to sections of permanent way, I think that, as a measure of prudence, it would be advisable to fix the loan period at somewhat less than the present practice of 30 years, in some cases, say, 20 years or even 15 years.

With regard to depreciation funds in addition to sinking funds, I understand that they are statutory in some, if not all, Scottish undertakings. Edinburgh applies to that purpose a sum representing 1¼d. per car mile run during the year, while Glasgow adopts a percentage basis varying according to the assets. Last year the total sum represented 3.8d. per car mile, or £490,000, whilst only slightly over £150,000 was actually spent on renewals. Had the undertaking based the provision on, say, 2¼d. per car mile (Manchester and Bolton) then the result would have been a surplus instead of a deficit.

I have pointed out that 22 authorities contributed from tramways last year, in reduction of local rates, nearly £270,000. Both the policy and principle involved in that course can be reasonably defended; it cannot be controverted that the rider should pay the cost of the means of transport, whilst the ratepayers in general, who in case of a loss are called upon to meet the deficit, are entitled to some compensation in respect of the risk of that happening. How exceedingly narrow is the financial margin on which tramways carry on the essential services which they render to the community, will be realised when it is remembered that the loss of one passenger per car mile run represents over £1,903,000, or considerably more than the amount set aside in the reserve and renewals fund last year. In these circumstances no one will deny that the risk of loss is a constant and a real one, or question the equity of the contributions when a genuine surplus is realised. I have also pointed out that 34 tramway authorities received assistance from the rates by a direct transfer last year to the extent of over £425,000.

What are the counter-considerations? The amount paid in rates on the permanent way alone last year exceeded £600,000. Without this sum the local rates of the authorities concerned would have been increased by an average of 2d. in the £. The cost of the upkeep of the permanent way—much of which is now ordinary road maintenance—was last year £1,905,000, to which must be added the interest on and the redemption of the cost of constructing it, amounting to about £1,123,000. Electricity for traction purposes cost last year over £2,691,000. The price per unit varied considerably, but from a return which was issued by the Association in October last, it is obvious that the great bulk of it was purchased at a price substantially in excess of the actual cost. It is, in fact, a complaint that in this respect some tramway undertakings subsidise electricity undertakings. The free-riding facilities provided for some deserving members of the community represent a considerable loss of income in many cases. Taken in the aggregate, the tramway industry will compare favourably from the financial point of view with many other industries in the country.

I now pass to another matter, namely, the keeping and publication of the accounts. In this connection it has ever been the aim of the tramway department, over which it is my pleasure to preside, to endeavour to produce and publish the annual accounts at the earliest possible moment, and my committee has had the advantage of being able to consider the annual statements of income and expenditure at the first monthly committee meeting succeeding the expiry of the financial year. This promptitude is highly desirable, in view of the fact that the value of any financial statement dealing with large expenditures is proportionate to the punctuality with which it is available in relation to the financial period treated. It has come within my observation that at a recent conference of a kindred body to ourselves, a member of that body felt himself able to go so far as to make these remarks:—

"It was essential to proper financial control that a local authority should have unity of financial administration. It was therefore necessary that there should be set up by each local authority a finance committee to take charge of and control the whole of the finances and accounts of the local authority. To be consistent with the principle of unity of control, it was also necessary that the chief financial officer should be responsible for, and have charge of, the whole of the finances, and that the accounts should be kept in his office." "There was a tendency for some departments, especially trading departments, to become self-contained and independent of the treasurer's department, which made it difficult for the treasurer to carry out his legitimate duties." "This was wrong in principle, because, as everyone knew, there was a strong temptation to committees and officials interested in any particular undertaking to show satisfactory financial results by methods which an experienced and impartial financial officer would not approve."

It cannot be, surely, that the speaker had in mind, when making these sweeping statements, the large tramway undertakings of the country, and yet these are just the municipal departments where an approximation to self-containment is reached. As the servant of the finance committee the city treasurer must, quite properly, carry out the duties of his office. Nevertheless, the arrangement which has obtained since the inception of the Leeds tramway undertaking has, in practice, been quite satisfactory, whereby the city treasurer and controller deals with all matters of loans, reserves, income tax and departmental audit, &c., whilst the books are kept, and other financial and statistical work carried out, in the accountant's section of the tramway department.

It is evident that the views referred to are not unanimously held by Local Government Officers—as the expressions show which recently fell from Dr. I. G. Gibbon, Assistant Secretary to the Ministry of Health, at the conference referred to. He said:—

"One school tends to regard all matters relating to accounts as a holy of holies within which it is almost impious for

any but the treasurer and his staff to tread. I am inclined to view this as a dangerous doctrine. The best results will never be obtained by a system of checks, however efficient. The mind, not the machine, in the long run is important. The best road to economy does not lie simply in a system of financial control. It is to be found by placing a full measure of responsibility, for economy no less than efficiency, on the head of each particular service."

In my view, the presence of an efficient and experienced accounting officer and staff in the tramway department, at all times assisting the head of that department in regard to financial matters—standing, as it were, at his right hand, following his various operations day by day, and preparing the necessary statistical and financial statements—is essential to the successful working of any large tramway in these days when keen competition (which may alter in incidence almost from day to day) has to be met; and the responsible officer should possess the means of learning, with the least possible delay, what are the results of such alteration in arrangements for handling traffic as he may think it necessary to make. Any change that might be made that would have the effect of transferring from his department the duties of recording and preparing such returns would necessarily make it more difficult for the responsible officer to secure such information as is essential to him in the daily conduct of the undertaking. Such changes might prove uneconomical, and would undoubtedly in the long run result in the duplication of work and staffs.

Discussion.

Alderman W. C. Fenton (deputy chairman, Sheffield Tramways Committee) said it was not generally known by the ordinary man in the street that municipal tramway undertakings had to bear so large a share of the cost of street improvements and street maintenance, as was the case. The reduction of fares because there was a small surplus was the wrong policy if the undertaking was to be kept in a sound financial position. Where the position warranted it, he felt that the ratepayers were entitled to some consideration, for it was upon their credit that the capital for the municipal undertakings was raised. At the same time, the undertaking should not be starved in order to make profits for the relief of rates.

Councillor G. Burke (vice-chairman, Blackburn Tramways Committee) suggested that there should be more strict regulations compelling local authorities to keep their accounts in a commercial way, i.e., providing a trading account as well as a balance sheet. Further, greater attention should be paid to the upkeep and maintenance of the permanent way and rolling stock. In Blackburn this policy had been pursued and the manager there claimed that the undertaking in that respect was as good as, or better than, when it was first installed.

Councillor A. Digby Willoughby (chairman of the Hull Tramways Committee) said it was possible to obtain assistance from the St. David's Committee for the purpose of track renewals on tramways, on those undertakings which were in a poor financial condition. Further, he believed that if the Minister of Transport was approached with regard to some of the difficulties confronting tramway undertakings financially he might allow from the Road Board Fund a fair amount of money towards helping in this direction. Hull had been helped very materially during the past few months from the Road Board Fund.

Councillor V. L. McEntee (chairman, Walthamstow Tramways Committee) complained that municipalities were not able to borrow money at the same cheap rates as private enterprise could. When a tramway authority desired to borrow money it was exploited by the financial people. Recently, Walthamstow had had to pay 5½ per cent. in borrowing £300,000, and he suggested that the executive council should go into that matter very carefully.

Mr. H. P. Stokes (manager, Plymouth Corporation Tramways) claimed that municipal tramway accounts were kept in the most simple form that could be imagined, and that there was certainly no public company operating transport which would dream of giving the same detail as was to be found in municipal tramway accounts. The paper did not deal very fully with capital expenditure. Many undertakings to-day were suffering from a heavy capital expenditure due to having bought out companies. Profits should be put into the undertaking in the same way that a company puts surplus profits into its undertaking. In that way they could avoid further borrowing. One saw at the present time corporations raising money to renew track at a high rate of interest and at the same time allocating sums from tramway profits to the relief of rates.

Alderman Sir Peter Peacock (chairman, Warrington Tramways Committee) said that Warrington to-day had no difficulty in borrowing at 4½ per cent. On a certain road running through Warrington to Liverpool and Manchester the cost of renewal of the tramway track was very great owing to the heavy through traffic, and although representations had been made to the Ministry of Transport, the Corporation could get no help, and it was told that the tramways were trading undertakings.

Councillor Major Fitzgerald Jones (deputy chairman, Salford Tramways Committee), referring to the question of overlapping loans, said that in Salford there were over-lapping loans and he failed to see how they could be avoided as it was impossible to isolate one portion of the undertaking from another for the purpose of loans. As regarded the relief of rates by means of tramway profits, many people, and he was one of them, were of the opinion that there was no reason why the present generation should subsidise posterity by being charged high fares in order to allow the next generation to have tramway undertakings free of debt. There might be circumstances in which contributions could be made to relieve the rates out of the tramway profits without injuring the riding public.

Bailie P. Burt (sub-convener, Glasgow Corporation Tramways) contended that it was wrong for one municipal department to subsidise another in any way, and added that unless municipalities could carry on an undertaking better than it could be done by private people, then private interests ought to be allowed to do it. The position in Glasgow was that the Corporation could not call upon the ratepayers to make up any loss on the tramways, but there was a fund called the Common Good, which belonged to the citizens and not to the ratepayers, and it was from that fund that the money was obtained for establishing the tramway system. One useful manner in which a surplus could be spent was to lay down tram lines in outlying districts which, although at present they might not provide sufficient revenue to show a profit, would eventually develop into a paying concern.

Alderman Smithson, replying to the discussion, said that although in Leeds a profit on the tramways was usually budgeted for in advance to be applied to the relief of rates at the end of the year, this did not prevent the tramway committee developing the undertaking to the full. This year, for instance, although a profit of £50,000 was estimated for at the beginning the tramway committee had reduced fares to an extent which would reduce the revenue by £40,000, and it might be that the Leeds "chancellor of the exchequer" would not get his £50,000 at the end of the year.

Electricity Supply at Salford.

Agecroft Station Inauguration.

The Salford Corporation's new Agecroft power station, a description of which is concluded on pages 527-28 of this issue, was opened with great ceremony and pride, by the Mayor of Salford, on September 23rd, in the presence of about 400 guests, including the electrical engineers and Mayors of nearly all the neighbouring Lancashire towns. An Electricity Week was also held, the chief feature of which was an exhibition in the Pendleton Town Hall. The Electricity Committee feels that as it now has the resources for meeting a large demand, every effort should be made to create the desire for electricity in the home. Twelve manufacturers participated in the exhibition, which was comprehensive in its appeal, so far as domestic devices were concerned. The Salford Electricity Committee has acquired premises for the opening of permanent electricity showrooms.

On the morning of the opening of the new power station, the guests were given the opportunity of making a tour of inspection. The Mayor, Alderman G. Billington, J.P., who is also chairman of the Electricity Committee, switched on a new 12,500-kW set, two others being already in commission. Subsequently luncheon was served at the Midland Hotel, Manchester.

Sir P. A. Nash, in proposing the toast of "The Electricity Undertaking," congratulated the Corporation on the manner in which it had set out to meet the great demand for electricity, indicating directions in which electric power would most usefully serve the needs of the community, and emphasised the scope for industrial electrification. On behalf of the contractors, Sir Philip asked the Mayor of Salford to accept a handsome piece of plate.

The Mayor of Salford, in acknowledging the toast and the presentation, said that the site of the new Agecroft station was bought originally for a refuse tip. When the present scheme was first put before the Council, it was turned down; eventually costs became more moderate, and the Council decided upon a progressive course. The Corporation was now in a position to assist all large manufacturers to bring down prices by offering them a cheap supply of power, and the Electricity Committee was not out for profits; it was not out to relieve the rates so much as to give the best service possible to the community.

Toasting the trade and commerce of Salford, Lord Colwyn, P.C., D.L., remarked that at one time Lancashire could produce goods cheaper than any other country in the world, but he was afraid that it would not be in that position again until there was a fuller manifestation of co-operative spirit amongst all sections of the community. He urged the young men of to-day to leave sport and recreation and to concentrate their minds on helping their country.

Lord Colwyn provoked a scene when he attacked Communist Sunday schools. A Councillor, apparently of Socialistic sympathies, took exception to some of Lord Colwyn's remarks and the dissension became marked; the Mayor of Salford appealed to the two or three recalcitrants to maintain order and Lord Colwyn desisted from speaking on the matter further, though apparently against the wishes of almost the entire company. When he sat down, he was given a remarkable ovation.

Mr. W. C. Bacon, J.P., chairman of the Manchester Ship Canal Co., said that his company was one of the largest consumers of electricity in the borough, and when developments now taking place had been completed, its load would easily be the heaviest. He was satisfied that electricity would eventually supersede the present wasteful use of coal.

Lieut.-Commander F. W. Astbury, in proposing "The Contractors," said he was delighted to observe that all the machinery in the station was British made and congratulated the Electricity Committee on this fact.

Sir J. Kemnal replied and Alderman J. P. McDougall, J.P., Deputy Mayor of Salford, toasted "The Engineer." Electricity was introduced in Salford 30 years ago, and he had been on the committee 23 years. Agecroft was their third station; in his time there had been five engineers and he was happy to observe that three out of the five were with them that day; the electricity undertaking had given £154,000 towards the relief of rates.

Mr. J. A. Robertson said that the Agecroft station was the result of much co-ordinating work in which many people were concerned, to all of whom he wished to pay tribute. In 1918 the borough was short of power, and the expedient was adopted of forging a copper link with their near neighbour. He hoped that this broadening of the views of the respective councils would be developed to a greater extent. In proceeding with the scheme the Salford Corporation had taken the long view. To-day the station had a load which would be remunerative even if it did not increase.

Mr. S. J. Watson, electrical engineer to the Salford Corporation, emphasised the policy of *service*, and said he hoped that in the near future there would be a great development in the domestic demand.

The final toast to the Mayor and Mayoress of Salford was enthusiastically honoured.

The Magnetic and Electrical Properties of Cast Iron.

By J. H. PARTRIDGE, B.Sc. (Hons.).

Abstract of a Paper read before the Iron and Steel Institute.

The paper is a record of the observations made from a series of experiments on specimens of cast iron, with elements of known and varying degree introduced to find the magnetic and electrical effects produced by them. Cast iron has the advantage of cheap production, convenient casting and machining properties, higher specific electrical resistance, and consequently lower eddy current losses. Hence the use of cast iron could be greatly extended if its magnetic properties could be improved. In 1902 Reusch, from a preliminary investigation, concluded that the carbon content plays an important part in the magnetic value of a material, whilst silicon plays a part chiefly inasmuch as it precipitates graphite, which latter hinders the magnetic induction; manganese did not seem to influence the magnetic induction unfavourably.

In 1921 Goltze concluded that silicon, carbon, manganese, phosphorus, and sulphur decrease the permeability of cast iron and should be kept as low as possible.

In the experiments made with the various constituents the iron was melted in a 30-lb. salamander crucible, and the elements were added either in the metallic form or as ferro-alloys, and bars 12 in. by 1 in. were cast in sand-moulds. The bars were machined down to 1.125 cm. diameter. The primary magnetisation curves were determined by using an Iliovici permeameter, and the hysteresis loops by the bar-and-yoke method. In order to determine the effect of silicon on the magnetic properties of cast iron, bars containing various per-

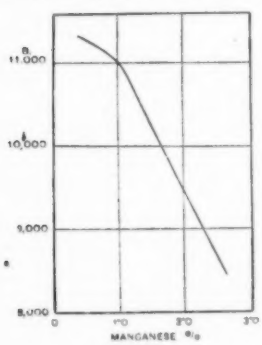


Fig. 1.

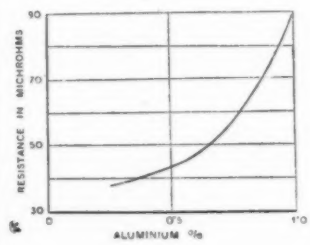


Fig. 2.

centages of this element were cast. Annealed and unannealed specimens were used and the most prominent feature was the magnetic superiority of the annealed bars. The magnetic properties of the cast specimens appear to deteriorate the higher the content of silicon. However, silicon does have a beneficial effect in the cast condition. Thus the magnetic induction of the annealed specimens increases with increasing silicon content. The magnetic properties of the samples were determined by taking hysteresis loops. In investigating the effect of manganese on the magnetic properties of cast iron, the manganese was varied whilst the silicon was kept constant.

Manganese is prejudiced to good magnetic properties and should be as low as possible when cast iron having high induction and high permeability is required. Fig. 1 shows the deterioration of magnetic induction with increase of manganese content. Annealing raises the magnetic induction. In the annealed condition, as in the cast condition, manganese increases the hysteresis loss and the coercive force, but decreases the magnetic induction and remanent magnetism. Since manganese tends to decrease the remanent magnetism, it may be concluded that the addition of this element to cast iron will not produce a material suitable for permanent magnets.

Aluminium was added to American washed iron. The magnetisation and permeability curves are given in fig. 3; specimens A1, A2 and A3 were annealed at 900 deg. C. for 15 minutes. There is a steady decrease in the maximum induction as the aluminium content is increased. The remanent magnetism also decreases as the percentage of aluminium increases. The effect of annealing is very pronounced. The curves of magnetisation and permeability for specimens A5 and A6 in the annealed condition are shown in fig. 3. The extreme high induction of these specimens is largely due to the small amount of combined carbon, and to the distribution of the graphite. Thus aluminium, up to 1 per cent., apparently increases both the coercive force and the hysteresis loss, but further addition causes a huge decrease. The coercive force and hysteresis loss of specimens A5 and A6 are very little greater than those of wrought iron. In order to investigate in detail the effect of aluminium on the magnetic properties of cast iron, it was decided to prepare alloys containing from 1 to 7 per cent., and from 18 to 24 per cent. of this element, *i.e.*, to prepare only those alloys which can be machined. Aluminimum decreases the maximum induction, the maximum permeability, and the remanent magnetism.

Chromium in the form of 62 per cent. ferro-chrome was added to American washed iron, to which sufficient 45 per cent.

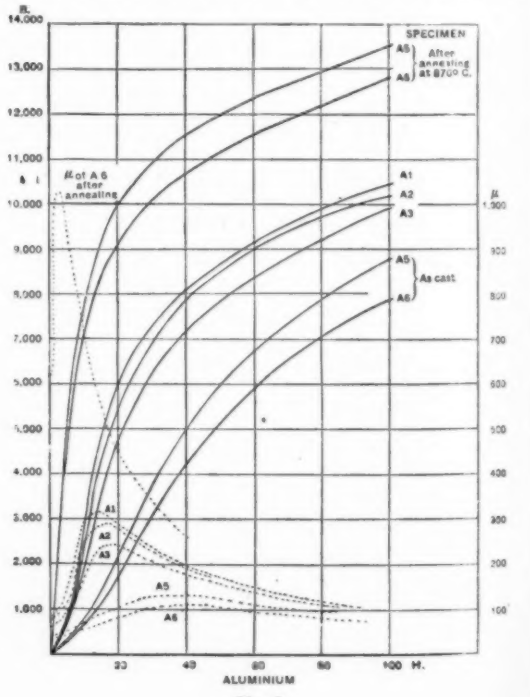


Fig. 3.

ferro-silicon had been added to raise the silicon content to 1.7 per cent. The specimens had to be prepared in two heats. The three bars containing the larger amounts of chromium were satisfactory, but the specimens containing the smaller amounts of this element were high in silicon. Thus chromium is prejudicial to good magnetic properties. Its addition decreases the maximum permeability and the remanent magnetism, and increases the force at which this maximum permeability occurs. Thus chromium appears to decrease the remanent magnetism, and to increase the coercive force and hysteresis loss. Apparently chromium is capable of giving a sufficiently high coercive force, but only at the expense of the remanent magnetism, which would be reduced to a very small amount.

In order to determine the effect of phosphorus, silicon and phosphorus were added to American washed iron. The effect of phosphorus is not very great, and it probably tends to increase the induction.

In another case cobalt, in the form of metallic cubes, was added to American washed iron in order to determine the effect of this element on the magnetic properties of cast iron. From the results of a preliminary experiment, it appeared that cobalt

would make the iron sound and precipitate sufficient graphite to render the iron machinable. However, this was not the case, and so the bars were remelted and silicon was added. Cobalt increases the magnetic induction, remanent magnetism, and the maximum permeability.

Microscopical examination of the specimens was carried out, and from this it would appear that the magnetic properties depend to a great extent on the microstructure. It was found that for the highest magnetic induction and permeability, the graphite should exist as temper carbon, and as much ferrite as possible must be present. Graphite in the form of flakes is not favourable to high induction. The presence of free carbide denotes low magnetic induction, and should be avoided at all costs when high permeability is required. The presence of carbide also indicates high coercive force, high hysteresis loss, and low remanent magnetism.

The specific resistance of the specimens was measured by passing a small current and measuring the potential drop between two points on the specimen. In order to get accurate results the current was reversed and the specific resistance determined for at least two different current strengths. It was found that silicon increases the specific resistance, and annealing reduces it. In the annealed specimens, the graphite exists in the form of temper carbon, and the continuity of the current is not affected to the same extent.

The effect of aluminium is to raise the specific resistance of cast iron. Annealing raises the resistance, due to the deposition of graphite, as is evident from the fact that the resistance of specimen A5 is less than that of specimen A3, whilst A6 has only slightly higher resistance than A3, although the specimens A5 and A6 contain more aluminium than A3. The increase in resistance due to aluminium is shown graphically in fig. 2. Phosphorus apparently increases the specific resistance.

From his observations made during the series of experiments described, the author has drawn the following conclusions, briefly stated :—

The highest magnetic induction and permeability are obtained with cast iron which has been annealed. When high permeability is required, the graphite should be in the form of temper carbon; as little combined carbon as possible should be present, and free cementite must be absent. In the cast state, silicon decreases the magnetic induction, but its presence may be advantageous in alloys which have to work at low flux densities (*e.g.*, transformer cores). Both in the cast and annealed conditions silicon reduces the coercive force and the hysteresis loss.

In both conditions manganese, nickel and chromium are prejudicial to high magnetic induction. In the annealed condition manganese and chromium increase the coercive force and hysteresis loss and decrease the remanent magnetism. In the cast state aluminium decreases the magnetic induction, permeability and remanent magnetism, and increases the coercive force and the hysteresis loss. In the annealed condition aluminium, in amounts up to 1 per cent., decreases the magnetic induction and the maximum permeability, but increases the coercive force and hysteresis loss.

Phosphorus has little effect on the magnetic properties of cast iron, probably tending to increase the magnetic induction in alloys containing silicon.

The presence of sufficient nickel, or nickel and manganese, makes cast iron non-magnetic.

In the cast state cobalt increases the magnetic induction and remanent magnetism, and increases the maximum permeability.

Both manganese and chromium are capable of giving a sufficiently high coercive force for a good permanent magnet, but in doing so they reduce the remanent magnetism to a very small amount.

Silicon, manganese, and aluminium raise the specific resistance of cast iron.

Cast iron has a very high specific resistance, and is suitable for resistance grids which have to pass heavy currents.

The Wireless Exhibition, 1925.

An All-British Display of Radio-Telephone Apparatus and Accessories.

(*Concluded from page 514.*)

General Electric Co., Ltd.

This company had a very comprehensive display of its radio-telephone products. Prominent among these were examples of super-heterodyne sets—one with six and another with eight valves—designed for a wavelength range of from 200 to 3,000 metres. The six-valve model was arranged with a glass panel to show the construction and movements of the set. Four-valve "Gecophone" cabinet and table sets were exhibited, as well as the new "Gecophone Junior" crystal set. Most of these sets were fitted with the company's new low-loss slow-motion variable condenser (fig. 21). This has an all-metal frame to which the rotary plates are connected. The vanes are of brass and of the "square-law" pattern. The fixed plates are insulated from the frame outside the electrostatic field. The spindle, which is operated by the knob, has a large disk at its end which engages by friction with the small diameter of a "two-speed" idler. The larger diameter

Fig. 21.—The New G.E.C. Low-loss Slow-motion Condenser.

Fig. 22.—Sterling "Mellovox" Loud-speaker.

of the latter engages again with the spindle of the moving vanes, and by this means a considerable speed reduction is obtained. It is claimed that the minimum capacity of this type of condenser is 1/50th of the maximum capacity. The coil holders shown include one for mounting behind the panel, the relative positions of the coils being indicated upon a dial at the front of the panel. Other components shown were a buzzer-type wavemeter; aerial-earth switches; anode reactance units, &c. A section of the exhibit was devoted to "Osram" valves.

Sterling Telephone & Electric Co., Ltd.

A range of standard receivers and amplifiers was on view with headphones and components. The loud-speakers included the "Mellovox," fig. 22, a new hornless model obtainable in three-colour combinations; the "Audivox II" is fitted with an adjusting device, and is claimed to be especially suitable for use out of doors. The Sterling "Super Invicta" battery is as simple as the Leclanché cell as regards ease in handling. Its dimensions are 9¼×7⅞×6¼ in., and no chemical depolariser is used, air being relied upon for this purpose. The initial voltage is 1.4 and the e.m.f., after the initial drop, remains practically constant during the discharge on a given external resistance, provided the size of cell is adapted to the ohmic value of this resistance. A large zinc surface is used for the positive and a special carbon for the negative elements; the special construction of the carbon blocks enables them to remain dry in spite of their immersion in the salammoniac electrolyte, so that the gases generated can mix freely, inside the blocks, with the oxygen in the air. The largest cell of this type has an approximate capacity of 500 ampere-hours when discharged at the rate of one ampere for eight hours daily.

S. Smith & Sons (M.A.), Ltd.

This firm's exhibit consisted of transformers, "Mouldensite" insulating material, small h.p. generators for driving motors, &c., and a new unit in the form of a resistance-capacity auto-transformer. The M.L. anode converter is a machine driven by an ordinary accumulator which is intended to take the place of high-pressure batteries for receiving and low-power transmitting sets. The various types of machine include those delivering two separate voltages for the detecting and amplifying parts of the set, and a special model for three or more resistance-capacity coupled amplifiers.

Autoveyors, Ltd.

In addition to condensers and such specialities as "Clix" and radio conduit, the company showed for the first time the high-frequency relay recently referred to in our pages. The adapted model exhibited, whilst retaining most of the principal features of the original design (as employed in the compound focus apparatus) has, in order to avoid too revolutionary a departure from existing subsidiary components and accessories, been confined in principle and design to conform to "valve" convenience, employment, and fitment. It is claimed to provide a means of adaptation of the h.f. relay as a form of "valve" to existing apparatus, and is said to employ electromagnetic phenomena.

S. G. Brown, Ltd.

The various loud-speakers shown by this company included a new cabinet of mahogany without a horn. The tuned-reed principle has not been departed from and a feature is the placing of a quartered moulded board in a central position immediately in the mouth of the flair, which enhances the instrument's appearance. A modified cheaper type of the original tuned-reed "A" headphone was noticed, besides gramophone adaptors, transformers, crystal sets, instruments for the deaf, and electro-megaphones.

Marconiphone Co., Ltd.

Besides valves, including transmitters, amongst the receiving instruments shown were reflex circuits and a new series of two-, three-, and four-valve sets of simplified tuning and construction for loud-speaker work. A large "straight eight" set, as shown in fig. 23, was noticed which employed five stages of h.f. amplification, followed by a detector and two l.f. stages. Reaction has been avoided entirely, which necessitated increasing the number of valves; nevertheless, the filament consumption is only 0.68 A at 6 V, or approximately the same as that of one "R" valve, while the h.p. consumption is said to be no larger than that of four-valve instruments. The dimensions of the cabinet are approximately 26 by 16 by 13¼ in. As regards components, the "Junior Ideal" transformer is new, and so is the "die cast" condenser of the square-law type. "Public address" equipment was demonstrated in the main hall, including the Round-Sykes magnetophone, and the valves shown included the D.E.6 (fig. 24), which is particularly suitable for the last stage of a l.f. amplifier using D.E.R. or D.E.2 valves in the initial stages. Its anode voltage is from 60 to 120 V, with from 5- to 10-V negative grid bias; the filament voltage may be from 1.8 to 2 V, and the filament current 0.5 A. The impedance is 10,000 ohms and the amplification factor 5.5.

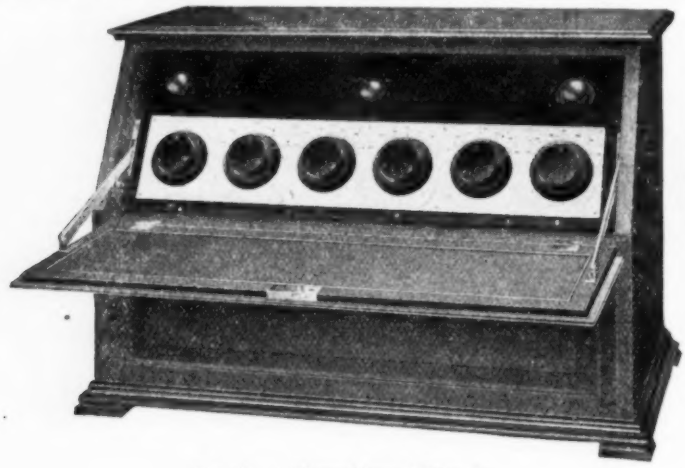


Fig. 23.—A Marconiphone 8-Valve Set.

Fig. 24.—The Marconi D.E.6 Valve.

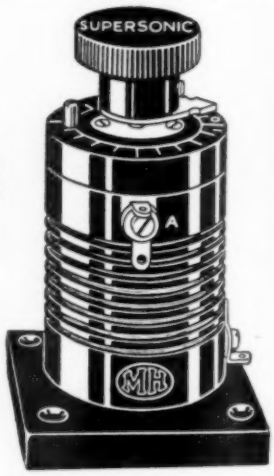


Fig. 25.—A McMichael Supersonic Transformer.

Chloride Electrical Storage Co., Ltd.

Amongst the various batteries and component parts shown by this company, PW cells for ships' wireless were noted, and the new high-pressure accumulator illustrated in fig. 26. The special features of the latter are: It needs to be recharged only once every six months when used for radio or similar purposes; it is supplied in a dry-charged condition and can be put into operation immediately after being filled with acid, but a freshening charge is desirable during the first month of use. The container is of moulded glass and no separators are required, while no brass or other corrodible material is employed. Every plate is visible, the acid level is plainly marked, and suitable connecting clips are provided with each battery for tapping in 12-volt steps. The battery is made up in 12-cell units, giving 24 volts per battery, the actual capacity of which is 5,000 milliampere-hours when used for very small discharge currents, such as are required for radio apparatus. The normal charging current is ¼ ampere and the weight of the battery is 15½ lb., its width being 4¾ in., height over the lead terminals 5¼ in., and length 8⅝ in.

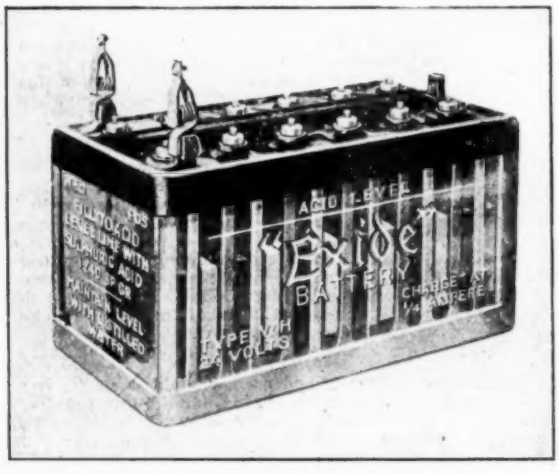


Fig. 26.—The Chloride h.p. Radio Battery.

L. McMichael, Ltd.

Complete receiving sets and many well-known accessories were shown. The firm's super-heterodyne tuned intermediate transformers, although by no means the first to appear, are original in design; the component is provided with a specially-constructed iron core, and a variable condenser to tune the primary is embodied in the top portion of the component, while a milled ebonite knob with a pointer rotating over an engraved scale enables accurate tuning within close limits. The transformer is illustrated in fig. 25. The company's reactor may be used to best advantage as the oscillator unit of a supersonic circuit when plugged in to either its special autodyne neutral point transformer when an autodyne circuit is being used, or into the No. 0 ordinary h.f. transformer when the heterodyne method is being employed.

The M.H. condenser test panel consists of an ebonite base with two terminals, to which are connected four pairs of condenser clips. It will be readily appreciated that by a combination of four clip-in condensers a wide variation of capacities can be instantly obtained by the simple expedient of clipping-in or unclipping the condensers. For obtaining the correct capacity across loud-speaker terminals, for instance, this component is obviously of value. The "Reversine" coil holder will have many uses, for it enables the moving coil to be reversed both in its physical and electrical relationships to the fixed coil. The triple rheostat provides for the control of up to four valves and allows extra valves to be added without disturbing the original lay-out of the panel.

M.O. Valve Co., Ltd.

This company had on view a selection of Marconi and Osram broadcast receiving valves, including 4-electrode bright and dull emitters, high-power commercial valves, and cooled anode 20-kW models. The D.E.T.1 type dull-emitter low-power transmitter is capable of dissipating up to 40 watts at the anode, with an anode voltage of 1,000 V, the filament current being 1.9 A at from 5 to 6 volts.

Radio Communication Co., Ltd.

The "Twin" is an extremely compact receiver, while the "Polar Four" incorporates two distinct tuning circuits, each of which can be tuned to a separate station and the set can be switched to either, thus affording a constant choice of two programmes; it is also suitable for use in a wired house system, enabling control of volume and choice of station from different points in the house. The "block" method of set assembly was represented, and amongst the accessories a hornless sound-reproducing instrument was seen; the dual and triple condensers shown should be very useful for simultaneous tuning, the two or three similar air condensers, as the case may be, being mounted on one spindle, and in order to prevent any risk of the vanes short-circuiting, mica vanes are introduced to separate the metal plates; screening sections separate the individual condensers so as to prevent unwanted coupling between the various sections. The limits of capacity available with the triple condenser are from 0.000014 to 0.00078 microfarad, and the component permits the simultaneous tuning of two or three circuits in one operation, *i.e.*, tuned anodes.

This company staged a representative group of transmitting and receiving apparatus as used on ships of the British mercantile marine. The display included a reproduction of a passenger liner's wireless cabin, in which was fitted a "Polar"

1½-kW transmitting and receiving set, a 1½-kW continuous-wave valve transmitter, and emergency transmitting and receiving apparatus with the necessary manipulating equipment; in addition there was shown a complete ½-kW spark transmitting and receiving set as generally used on an intermediate-type ship, and a ¼-kW spark transmitting and receiving set as usually fitted on board a cargo vessel. A lifeboat transmitting and receiving set was on view and a model of an automatic call device, designed to keep watch on board ship during the absence of the operator and to give an alarm in the event of a distress signal being received.

Burndept Wireless, Ltd.

A full range of this company's well-known apparatus was exhibited, including the new "Ethodyne" seven-valve super-heterodyne receiver, the chief features claimed for it being selectivity and extent of range. Two frame aerials, for plugging into the top of the cabinet, are supplied with the set; one for 250 to 500 metres and the other for 1,000 to 2,000 metres, with a change-over switch. All the tuning is done by the two centre knobs (fig. 27) and the seven valves are of four different types, to ensure that each is correct for the work it has to do. A switch enables one or both power valves to be used; volume control allows the set to be used two or three miles from a station. Besides a series of components the firm supplies valves which are "guaranteed" and a "super-vernier" dial for the fine adjustment of condensers, reaction couplers, variometers, &c., which may be fitted to any set without dismantling it in any way. Concealed within the dial (fig. 28) is a novel friction-driven epicyclic gear and when the knob is rotated it causes the dial and condenser to turn in the ratio of 7 to 1; if rapid searching is required, the dial is rotated instead of the knob. An exhibit was staged in the gallery to illustrate the auto-broadcast system as installed in the Waterloo Hospital under the *Daily News* Wireless for Hospitals Fund. Lead-covered wiring is run throughout the building in a similar manner to lighting circuits and listening points are provided in all the wards. With the aid of the fund seven hospitals have already been equipped in this way and nineteen are in process of being equipped.

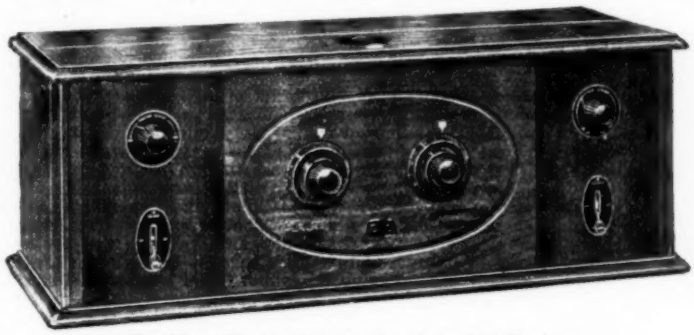


Fig. 27.—"Ethodyne" 7-valve Super-heterodyne Receiver.

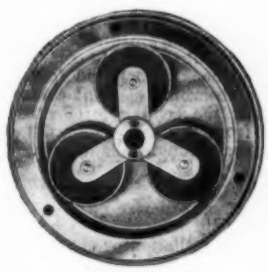


Fig. 28.—Base of Burndept Condenser Dial.

Gent & Co., Ltd.

Besides a variety of "Tangent" radio fitments, there were on view complete receivers, headphones, loud speakers, and a.c. rectifiers for high-pressure supply. The company also caters for constructors' requirements.

Sylvex, Ltd.

This company showed "Sylverex" natural galena crystals and "Kathoxyd" crystals, which are composed of a small brass cup that holds a metal plate covered with a chemical compound. Two special contacts are supplied, one being made of zinc-iron and the other of graphite.

Dubilier Condenser Co. (1925), Ltd.

Amongst typical types of condensers for broadcast receivers, transmitting stations, and laboratory use, the "Univane" pattern was of interest. It is a new type that provides the electrical equivalent of mechanical vernier gearing throughout the full range of the condenser, and this desirable result is accomplished by a simple arrangement by means of which the rotation of the knob of the condenser moves only one vane of the condenser at a time. As soon as one movable vane has been rotated into position where it interleaves with the fixed vanes, a second vane is picked up and is rotated into position as the knob is turned. Thus the full movement from minimum to maximum capacity requires several complete revolutions of the knob of the condenser which enables very fine tuning to be obtained. The number of times that the knob has been turned is shown on a small auxiliary indicator attached to the front of the instrument alongside the dial. The instrument is suitable for use in all types of radio receiving sets.

Other Exhibitors.

The following firms also exhibited sets and accessories:—Auto Sundries, Ltd.; F. E. Wootten, Ltd.; Bowyer-Lowe Co., Ltd.; British Ebonite Co., Ltd.; Neutron, Ltd. (synthetic crystals); J. J. Eastick & Sons; Eagle Engineering Co., Ltd.; Beard & Fitch, Ltd. ("Success" supersonic-heterodyne receivers and components); A. C. Cossor, Ltd.; Pell, Cahill and Co., Ltd.; Falk, Stadelmann & Co., Ltd.; Climax Radio Electric, Ltd.; British Radio Corporation, Ltd.; Hirst Bros. & Co., Ltd.; National Wireless & Electric Co.; Hart Accumulator Co., Ltd.; London & Provincial Radio Co., Ltd.; "Kenmac" Radio, Ltd.; H. Quartermaine (earthing device).

Marconi's Wireless Telegraph Co., Ltd., staged an interesting exhibit of historical apparatus, while the undermentioned firms exhibited sets and accessories manufactured by members of the N.A.R.M.A.T.:—Messrs. Cables & Electrical Supplies; A. W. Gamage, Ltd.; Brown Brothers, Ltd.; Selfridge & Co., Ltd.; H. J. Galleries; Hobday Bros., Ltd.; East London Rubber Co.; and A. J. Dew & Co.

New Electrical Devices, Fittings and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

An Electrical Propeller for Water-Velocity Measurement.

A recent production of the Stonebridge Electrical Co., Ltd., Victoria Road, North Acton, W.3, takes the form of an apparatus for measuring the velocity of a water system, and is built on the principle of the electrical tachometer. It permits, it is claimed, the direct measurement of the momentary value of this velocity, without intermediate calculations. The device consists of a propeller, direct coupled to a very small generator mounted on a common spindle and enclosed in a metal case which is divided into three compartments. The front portion contains a pipe filled with oil, in which the bearings of the driving spindle are located. The rear compartment houses the generator, a small magneto machine of about 0.3 W max. load. In the middle compartment the spindle is decreased to 1 mm. diameter, with double bearing, in order to reduce the friction and render the compartment watertight. A suitable lubricant fills the space between the two middle bearings. In the case of water entering this, it can be easily removed by loosening a screw, the head of which acts as a support. The indicator comprises a small precision instrument which measures the voltage produced by the generator, transmitted by means of a watertight contact piece and a twin flexible cable. The voltage is proportional to the water velocity.

An Electrical Refrigerator.

The Delco-light Co., 717-723, Fulham Road, S.W.6, manufacturers of the Frigidaire electrical refrigerator, exhibited a film bearing the above title to a gathering of their dealers and others interested in refrigeration at Frascati's on September 9th. The film is very instructional. Commencing with specimens of primitive cooling systems, such as the "Water Caves" of our forefathers, the principles of which are fully demonstrated, it proceeds to the "ice-chest" period, in which stress is laid on the rising temperature and diminishing ice factors, together with the processes by which food is affected in the moist atmosphere of the ice-box. Finally we reach the "Frigidaire" electrical refrigerator, and in this section the full working processes of the plant are shown. The plant is automatic; it is fitted with a thermostatic device which starts and stops the compressing unit whenever the temperature of the cabinet necessitates it, so that there is no waste of current nor can the temperature ever rise above a certain point, which is several degrees colder than ice at its lowest temperature. It is claimed for the "Frigidaire" that it provides an absolutely dry germ-free atmosphere in which food is preserved for a much longer period and in more hygienic conditions than is possible in an ice-chest. It can be operated from any electricity supply at, it is claimed, trifling cost, and is

made in sizes to suit the small household or the requirements of those who want up to 400 cu. ft. of refrigerated space.

The accompanying illustration (fig. 1) is of a "Frigidaire" plant. The heat-absorbing element is sulphur dioxide in liquid form. This vaporises at temperatures above 8 deg. F. The compression brought about by the vaporisation operates the switch controlling a small electric motor driving the compressor, at a temperature of 28 deg. F. The sulphur dioxide is compressed into a cooling coil, where it is cooled down till it is converted back into liquid form, when it is again circulated into the absorbing element container. In the latest design of the plant the cooling is effected by air circulated by a fan driven from the compressor motor. In the older designs the cooling was brought about by water circulation.

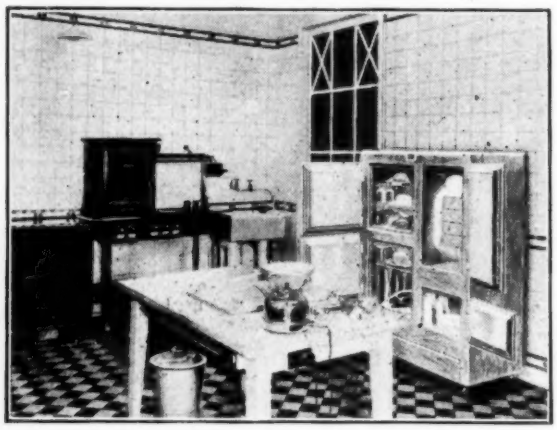


Fig. 1.—A "Frigidaire" Refrigerator.

A Transformer Truck.

The increase in size of the plant in use by the larger electricity supply undertakings and the advantages arising from the rapid installation or changing-over of plant have made the provision of adequate handling facilities of importance. The Brush Electrical Engineering Co., Ltd., Falcon Works, Loughborough, has designed special trucks to suit the requirements, one of which is shown in fig. 2; this truck is designed for loads up to 25 tons, and is intended to facilitate the handling and movement generally of transformers and other plant of a similar nature. Arranged to run on main-line railways, it can be used in conjunction with standard railway locomotives and wagons, the usual spring buffers and centre draw hooks and chains being provided. The wheels are of cast steel, mounted on large-diameter axles, provided with ball bearings at the extreme ends. Side lever brakes are fitted, and at each corner there is an adjustable screw column so that the truck may be secured in a level position when being loaded and unloaded, and the possibility of tilting during such an operation is avoided. The floor of the truck is provided with lines of holes to take adjustable stretcher bars of wood, so that the transformer can be firmly held in position during shunting operations. The truck should be of considerable advantage where transformers have to be moved into or out of sub-stations or other buildings, as it can be run into a siding or pit adjacent to the building, and by means of the rollers usually provided the transformer can be quickly run off the truck when the stretcher bar has been removed. The requirements of this class of rolling stock will, of course, vary with the individual requirements of different undertakings, and the makers have different types under construction to suit the particular conditions for which they are needed.

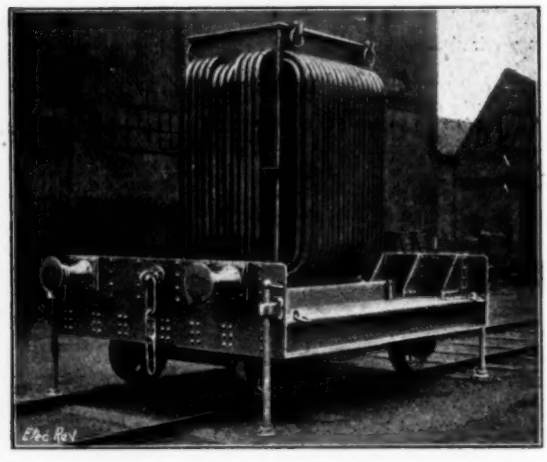


Fig. 2.—A Brush Transformer Truck.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Charges for Electricity Supply.

I was much amused at "Stung's" letter in last week's Review (Sept. 18th), and I cannot let it pass without replying.

To begin with, gas can be stored very conveniently, electricity cannot. Gas should be sold at about 1s. 6d. per thousand and still show a profit—a lot of it is carburetted water, is a deadly poison, blackens ceilings, ruins leather upholstery, burns up the air, &c., *ad infinitum*.

Gas is sold at about three times its value to enable the gas department to change the street lamps every few years, trying to compete with electricity; to lend gas stoves and lead piping to anyone who will use it; to fit powerful lights outside shops at a very cheap rent; in fact, anything that will use gas can be had for next to nothing.

Gas shows such a good profit that they can afford to do it. I would suggest that "Stung," if he is still dissatisfied after reading this, goes back to it and gets value (according to his idea) for his money—the electricity department would not miss him!

Why, even the chairman of the gas department, who thinks (or at least, says) his gas is wonderful, uses electricity!

In rural districts, the people pay anything from 6d. to 10d. per unit for the privilege of having electricity, and I cannot believe the Eccles electricity department will put a service in, supply a meter and a man to read it if they cannot see a return of 30s. per annum paying for what is used at a flat rate.

According to "Stung's" idea, if a house is closed up for a year or two, no charge should be made for service. He wants vision and should think of it like this: A host of men are employed, countless thousands of pounds sterling have been paid out, to give him a supply of electricity, and if when he pressed his switch, no light came, he would have a just cause for complaint. It is up to him to use electricity freely for everything possible, so that his rateable value will be only a small proportion of his total bill. In my own case, frequently I used 2,000 units per quarter and my fixed charge was 30s. per quarter, so that my total inclusive cost per unit was less than ¾d.; at that price there is no room for argument about coal or gas and we cannot forget convenience, cleanliness, and all the other stock arguments.

About 150 small houses had electricity installed about sixteen years ago, the builder buying electricity in bulk and charging 1s. per week in the rent; no meters were installed, no heating or other devices were allowed, and it was found that at 3d. per unit, each house averaged 2s. 9d. per week the year round for lighting only.

As the builder was losing money on this, meters were put in and the average came down to 1s. 3d. per week. I therefore cannot see how "Stung" can have any grievance against the department's insisting on a minimum of £2 per annum, and if he will get busy and buy a few second-hand radiators and use *them*, giving up, "in view of his poverty" his preference for a coal fire, he will find that he gets most wonderful value. There will be less work in the house, he can put ferns in his grate, his wife (if he is married) will be all smiles, having less work to do, and everybody will be happy. He may leave the hall light on every evening, making the house look cheerful.

September 21st, 1925. **E. O. W.**

The Manufacture of Induction Motors.

With reference to Mr. Shaw's letter in your issue of last week, Mr. Shaw will appreciate that the information on which the estimate is based is of a confidential nature and therefore cannot be published.

In anticipation of any scepticism we submitted to you in confidence the basis of the estimate. If Mr. Shaw is seriously in doubt as to the accuracy of the statements contained in the advertisement to which he refers, we suggest that he make an appointment to meet the writer, when we have no doubt we shall be able to give him sufficient information to remove such

F. & A. Parkinson, Ltd.

Guiseley, *September 22nd*, 1925.

[Since the advertisement appeared we have received from Messrs. Parkinson certain figures in support of their claim, the accuracy of which we, of course, are not in a position to vouch for; doubtless they would be pleased to disclose them in confidence to Mr. Shaw. They are also publishing their own output figures for last July in our advertisement pages to-day. Is there any reason why they should not publish replies to Mr. Shaw's questions Nos. 2, 3, and 4?—Eds. Elec. Rev.]

Rural Electricity Supply.

Some very interesting information, in my opinion, is given in the "Correspondence" columns of your issue dated September 25th by Mr. W. Fennell, of the Mid-Cheshire E.S. Co., in particular his remarks on the use of single-phase current, which is only now beginning to be considered on the Continent, as hitherto they have adhered to a 3-phase supply for all power purposes (only utilising single-phase for small lighting loads). His figures of cost of tappings are a remarkable example of what energy and skilled enterprise can bring about, and should do much to take "the wind out of the sails" of those

who make their excuse for not supplying a rural area, that it would cost them over five times the amount of the expenditure to which the Mid-Cheshire E.S. Co. has to go to attain the same end.

As regards the difficulties of possible interference of power lines with telephone lines, there is a great deal in the old saw that "possession is nine points of the law." The telephone engineers were in the field first, and they have built up a fund of accumulated experience upon which it is easy for them to draw when they come in contact with an overhead electrical transmission engineer who, though he may be an expert on his own subject, is not so well versed in the subtleties of the law and custom. The telephone engineer, after all, is only human and he has enough troubles of his own, without adding to them the possible interference of high-pressure transmission lines; so it is obvious that he is not going to make things too easy for the transmission engineer. Again, a powerful government department is very different from a small electricity supply undertaking, and can therefore carry many points by its own weight. Personally, I have always got on very well with telephone engineers, but I have always found it most expedient to confer with them, at as early a stage as possible, in connection with any proposed new development. Still, as your correspondent indicates, it would be just as well if all the electricity supply undertakings could agree on a common basis.

Apart from telephone matters, a much freer hand will be necessary in the design of rural electrification networks. To attain this end there must be some method whereby existing regulations—intended really for entirely different conditions—need not be complied with; hence a solution to this very important question, as to how this can best be accomplished, is badly needed. Mr. Fennell has given some most useful indications as to what is required: now it is for others to add to his contribution.

R. Borlase Matthews.

East Grinstead, *September 25th*, 1925.

The Roman Baths at Bath.

The advertisement on page xxxiii of your issue of September 18th, referred to by Messrs. Johnson & Phillips in their letter in your current issue, was not inserted to flatter them or anyone else. It was inserted to remove a misleading impression—undoubtedly unintentional—that would be sure to be produced by their advertisement in your issue of August 7th (Supplement, p. 11) and to emphasise the principle of "Truth in Advertising."

W. T. Henley's Telegraph Works Co., Ltd.
(W. A. Moore, *Advertising Manager.*)

London, *September 25th*, 1925.

Current Literature.

As of necessity I have to (and like to) keep myself well informed, I have always used such digests as are available. Hence I appreciate your correspondent's suggestion. However, I also know the difficulties. I find it to be a very good plan, if one wants something of this sort and at the same time feels that it has a wide benefit, to start it. If you have compiled a really useful table and would like to have it neatly in print, get it published, and then you benefit others as well as yourself.

Some time ago the Electrical Review used to publish, fortnightly, a classified list of its own contents, which I, personally, and a number of my acquaintances, found very useful. Its only drawback was that it appeared a little late and lacked an international classification.

I started a weekly digest of all the more important current electrical articles in the columns of *Electrical Industries*, a number of years ago. This feature is still running, though the international classification has been dropped. I am at present attempting to deal with all published matter concerning the applications of electricity to agriculture in a monthly journal that I am editing, entitled *Electro-Farming*.

Science Abstracts covered the field very well, but its time-lag was too great for me. It also suffered from the lack of international classification.

A number of digests of current literature are prepared by various associations and companies in this country; in fact, there is a good deal of overlapping of work. The Association of Special Libraries and Information Bureaux (38, Bloomsbury Square, W.C.1) is doing a great deal to bring about co-operation between those who are digesting various classes of current literature. Your correspondent should get in touch with the secretary. The second annual conference of this Association has just been held.

My general view is that what is chiefly required is (*a*) the classification preferably on the International basis, (*b*) the author's name, (*c*) the mechanical particulars, *i.e.*, length of article and number of illustrations, (*d*) a brief note to give a clear indication of the contents, and (*e*) most important, prompt publication while the journals digested are still current. Rarely can an abstract be sufficient in itself, it should be rather a guide to the article as to whether or not it is worth looking up, since, for serious work, one must always read the original article.

There are over 24,000 scientific and technical periodicals, all of which at some time or other refer to electrical matters, so their abstracting is not an easy affair.

R. Borlase Matthews.

East Grinstead, *September 25th*, 1925.

A Disclaimer.

It has come to my knowledge that a rumour is in circulation that I have accepted the agency of a well-known firm of Austrian manufacturers. Although we all know that rumour was ever a "lying jade," to be severely ignored—in view of the fact that I continue to hold the office of chairman of the N.A.R.M.A.T. Special Committee for the Safeguarding of the Radio Industry, I feel it incumbent upon me in this instance to give rumour the lie direct by stating that I personally have had no business negotiations with any person or firm in Germany or Austria since the outbreak of war; further, I have not accepted the agency for, or taken a commercial interest in, any foreign firm.

I shall feel greatly obliged if you will be kind enough to publish this letter in your next issue.

Guy Burney.

London, *September 28th*, 1925.

Legal.

Telephone Contract Dispute.

In the Mayor's and City of London Court, before Judge Shewell Cooper, on September 22nd, the New System Private Telephone Co., Ltd., Arundel Street, W.C.2, sued Messrs. B. Maisel & Co., Moorgate, for £11 7s. 8d., rent of a telephone installation from January 1st, 1924, to June 30th, 1925. Defendants counter-claimed for damages for breach of contract and a declaration that they were not bound by the agreement of May 29th, 1919, whereby they undertook to rent an installation for 21 years. Alternatively they claimed rectification of the agreement so as to entitle them to give three months' notice to determine it. For the plaintiffs it was stated that the defendants signed the contract in May, 1919, hiring an installation with four instruments for 21 years. The rent had been paid until that now sued for and the defendants sought to say that the contract was void owing to the fact that the instruments had to be attended to from time to time. Documents were produced on behalf of the plaintiffs, which showed that the installation had been periodically examined, and signatures given on behalf of the defendants that all was in order. For the defence, evidence was given by Mr. T. G. Dobb, general manager of the defendant firm, that throughout the period in which the installation had been in use it had been a constant source of trouble. Lately it had been out of use altogether as it was so unreliable. Cross-examined, witness admitted that he signed a contract for 21 years, but said that when he did so he was under the impression that it was not for such a long period, but was subject to six months' notice on either side, and his firm had given such a notice, which, however, the plaintiffs had refused to accept. Witness admitted that from 1921 to 1923 no complaint was made with regard to the telephone in writing, and he also admitted that periods of many months occurred when, according to the records kept by the plaintiffs, everything appeared to be in order. Judge Shewell Cooper said there was only one construction to put upon the contract and that was that it was for a period of 21 years. With regard to the present claim he was satisfied that at times the apparatus had gone wrong and adjustment, and attention was necessary, which was only to be expected in an installation of that kind. It was admitted, with the exception of one occasion when a delay of six weeks was experienced, that the plaintiffs had always attended and overhauled the apparatus when requested to by the defendants. For that six weeks' delay plaintiffs had made a generous allowance. In his view the plaintiffs' claim succeeded, and he gave judgment for them on the claim and counter-claim, with costs.

Radio Goods Conspiracy.

After a trial lasting five days, the hearing was concluded at the Central Criminal Court, on September 23rd, of the case against Naum Abram Ludwin, 34, merchant, and James Smith-Hickie, 26, merchant, who were charged with conspiracy to defraud and with obtaining goods by false pretences.

Mr. Gerald Dodson, opening the case for the prosecution, said that the accused were charged with conspiring together with a man named Anatole Iban Zaitzeff, 54, merchant, who, although he had appeared before the committing magistrates, and been bound over to attend the hearing, had absconded from his bail, and at the present moment the prosecution was unable to arrest him. The two men before the Court, in addition to the conspiracy charges were also charged with defrauding various traders, the method of the frauds being to get goods by representing that they were carrying on a *bona-fide* business in the ordinary way, when in reality they got the goods in order to sell them for any price that they might be able to fetch, and put the money in their own pockets. Between July, 1924, and April of this year, they obtained goods to the value of approximately £1,500. Those goods had never been paid for. The defendant Ludwin was a naturalised British subject of Russian origin and was a half-brother to Zaitzeff. The other defendant, Smith-Hickie, got into touch with those two men comparatively recently and occupied a position with them of considerable importance. It was alleged that he was general manager of Ludwin & Co., and managing director of Importex, Ltd. Those two businesses were those which the defendants purported to carry on as genuine businesses. The defendant Ludwin appeared to have begun a business in 1921, or possibly earlier, at 26, Gray's Inn Road, and

he carried on under the style of N. A. Ludwin & Co. In 1923 he removed to an address at 122, Bunhill Row, taking the first floor of those premises. There then came into existence upon the door of those premises the names of a number of businesses and companies. There were the General Distributing Trading Co., Ltd.; British & Overseas Dental Supplies, Ltd.; N. A. Ludwin & Co.; A. I. Zaitzeff & Co., Ltd.; Importex, Ltd.; and the Lancashire Trading Co., Ltd. It was alleged by the prosecution that those businesses and companies had been used for the purpose of giving references to each other. In addition, Counsel said that there was another company called Darag (London), Ltd., but the name of that company did not appear on the door. About December, 1924, Messrs. Hogan and Wardrop, electricians, supplied goods to the value of about £150. They were given three bills of £50 each by way of payment, and those bills were accepted by Ludwin on behalf of Importex, Ltd. The first of the bills was met, but the other two were dishonoured. Ludwin asked Messrs. Hogan and Wardrop to accept payment of £20 weekly until the debt was liquidated. Two cheques for £10 each were given and met. Afterwards, however, Messrs. Hogan & Wardrop were forced to take proceedings and they recovered £29. The balance due to them was £53. Counsel, quoting another case, said that Ludwin had approached the Igranic Electric Co., Ltd., and obtained a large quantity of goods.

At the conclusion of the case for the prosecution Ludwin gave evidence denying the charges. He said that he had been robbed of a large quantity of goods. In his absence from the business goods had been sent by Smith-Hickie, to a firm known as Hoile & English. Witness said, "Hoile & English is a firm carried on by Smith-Hickie's wife and a wife of one of my travellers. Goods I paid 15s. for have been disposed of by them for half that amount." Witness added that Hoile and English owed him £800. If that money had been paid it would have gone to his creditors. SMITH-HICKIE in the witness-box denied the charges, but admitted that his wife was a partner in Hoile & English. Goods had been supplied to that firm by him.

After a short absence the jury found both the defendants guilty.

The JUDGE said it was not an ordinary case of long firm fraud. It was not a bogus concern started with the dishonest purpose of entrapping traders, but they sought to bolster up the business by dishonest means. Sentence of six months' imprisonment in the second division was passed on both the defendants.

Theft of Electricity.

AT Falmouth Police Court, on September 24th, Frederick Ernest Deeble, principal of the firm of J. H. Deeble & Sons, electrical engineers and yacht furnishers, was charged with fraudulently abstracting electricity belonging to the Electric Supply Corporation, Ltd. It was stated that on July 3rd, 1924, the meters at defendant's premises were inspected by the Corporation's resident engineer and manager, Mr. A. R. Howden, and found in order. On July 9th a meter inspector examined the cut-outs and meter cards, and, two days later, in consequence of information, Mr. Howden examined all the meters, which were in order with the exception of the power meter. That one was unsealed, and a match had been jammed between the revolving disk and the magnet and a piece of bell wire also connected with the terminals inside the meter. Either of these was sufficient to prevent the meter working.

Pleading guilty on behalf of defendant, Mr. H. S. PRIDEAUX said the facts were admitted. The distressing position in which Mr. Deeble found himself was due to a very foolish and ill-considered action on his part. He was ready to assist the Corporation in every way to arrive at the amount of current consumed and to make full reparation. Mr. Prideaux appealed to the Bench to treat defendant as a first offender.

The MAYOR said that the magistrates felt that this was a case where the trust and confidence of commercial life was at stake, and they could not do less than fine defendant half the maximum penalty, namely, £25.

Stoller v. Davidson & Co.

IN the Whitechapel County Court, on September 21st, before Judge Cluer, a reserved judgment was delivered in a case in which Abraham Joseph Stoller, Stepney, E., sued Messrs. E. Davidson & Company, Stepney, E., electrical engineers, to recover £3 15s. 6d. for an accumulator entrusted to the defendants on May 8th for charging and destroyed by fire the same night on the defendants' premises. The case was heard in July. A member of the defendant firm said that the fire was caused through accumulator acid leaking. If the acid touched anything, it would complete a circuit, cause a spark, and so give rise to a fire. A faulty or leaky accumulator was not usually taken to an electrical engineer for charging. Judge CLUER said that the plaintiff had to prove that the defendants had been negligent. So far as the evidence went, the fire was not caused by any negligence of the defendant firm. Judgment was accordingly entered for the defendants, with costs.

The Mersey Tunnel.—Work upon the construction of the new Mersey tunnel is to commence at an early date under the supervision of Mr. Basil Mott and Mr. J. Brodie, the City Engineer of Liverpool.

Published Specifications.

Compiled expressly for this journal by Patent Agents.

The name of the applicant's patent agent, if any, will be found on the printed specification.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

2,199. "Electrically-driven tools and the like." T. H. Hurst and Hurst Electrical Plant, Ltd. October 27th, 1924. (238,926.)

6,134. "Electric furnaces and the like." W. A. Loke. March 10th, 1924. (239,249.)

10,682. "Telegraph repeater." H. Angel and Western Union Telegraph Co. April 30th, 1924. (239,253.)

11,409. "Warning device for use with electrically-controlled machinery." A. E. Billingsley. May 8th, 1924. (239,259.)

13,121. "Radio direction finders." F. Woods. May 28th, 1924. (239,263.)

13,263. "Tuning or inductance-coil units for high-frequency circuits for use in wireless receiving apparatus." A. W. Sharman and Radio Acoustics, Ltd. May 29th, 1924. (239,267.)

13,531. "Electric connectors." M. D. Davis. June 2nd, 1924. (239,275.)

13,573. "Electrical switches and the like." E. S. Rogers. June 4th, 1924. (239,277.)

13,689. "Compound electric machines." Siemens-Schuckertwerke Ges. June 5th, 1923. (217,226.)

13,744. "Means for ventilating railway carriages, tramcars, ships, and other electrically or mechanically operated vehicles, or subways, buildings, or the like." J. H. Gath. June 5th, 1924. (239,283.)

14,005. "Safety braking appliances for motor vehicles, tramcars, and other power-propelled vehicles." G. O. Evans. June 10th, 1924. (239,294.)

14,151. "Vacuum electric tube devices." E. Y. Robinson and Metropolitan-Vickers Electrical Co., Ltd. June 11th, 1924. (239,299.)

14,770. "Radio-telephonic and other radio-frequency signalling systems." G. W. Hale and Radio Engineering Co., Ltd. June 18th, 1924. (239,309.)

14,771. "Apparatus for wireless reception." G. W. Hale and Radio Engineering Co., Ltd. June 18th, 1924. (Cognate application 7,310/25.) (239,310.)

15,364. "Automatic and semi-automatic telephone systems." Automatic Telephone Manufacturing Co., Ltd. (Automatic Electric Co.). June 24th, 1924. (239,314.)

15,442. "Electric plug-in connectors." British Thomson-Houston Co., Ltd., and W. F. Boyd. June 26th, 1924. (239,315.)

17,617. "Drums and a method of carrying the drums for electric cables for mines and like works." J. R. Bond and S. Robinson. July 23rd, 1924. (239,325.)

17,623. "Condensers used in connection with wireless telegraphy and telephony." A. A. Price and Price's Battery & Radio Co., Ltd. May 22nd, 1925. (239,326.)

17,908. "Loud speakers and other sound-reproducing or sound-transmitting apparatus." A. H. Midgley. July 26th, 1924. (Cognate application 20,706/24.) (239,331.)

18,107. "Electrical condensers." C. E. Racburn and W. E. Taylor. April 24th, 1925. (239,333.)

18,938. "Crystal detectors for wireless receiving sets." A. Gooch. August 9th, 1924. (239,338.)

19,265. "Rotary detector for use with crystal wireless receiving sets." W. Stuart. August 14th, 1924. (239,341.)

19,421. "Socket tubes for electrical connectors, wall sockets, and the like." C. L. Arnold and "M.K." Electric, Ltd. August 16th, 1924. (239,345.)

19,569. "Electrogalvanic method of, and electrolytic bath for applying protective covers on electric conductors, especially metals." J. H. Mellquist. August 18th, 1924. (Convention date not granted.) (220,944.)

19,647. "Starters for automobile engines." A. G. K. Hansen. August 19th, 1924. (239,347.)

20,030. "Holder or suspension fitting for electric lamps." J. Lawton and Sons, Ltd., and F. G. Martin. August 25th, 1924. (239,352.)

20,887. "Synchronous transmission of several messages over one wire by means of alternating currents of different frequencies." C. Lorenz Akt. Ges. September 24th, 1923. (222,462.)

21,310. "Thermostatically-controlled electric switches." E. C. R. Marks (Hart Manufacturing Co.). September 9th, 1924. (239,361.)

22,473. "Electric signalling bells." W. B. Dale, R. A. Hopkinson, and J. Hopkinson & Co., Ltd. September 23rd, 1924. (239,373.)

22,554. "Telephone systems." Coventry Automatic Telephones, Ltd., and V. Amberg. September 24th, 1924. (239,374.)

24,230. "Microphones." L. Darimont. October 22nd, 1923. (223,900.)

24,946. "Impregnating medium for electrodes." L. Kahl and Rütgerswerke Akt. Ges. October 20th, 1924. (239,387.)

27,171. "Electric motor-driven change-speed device." E. C. R. Marks (Hendey Machine Co.). November 13th, 1924. (239,295.)

28,003. "Deoxidation of gases in tanks for electrical apparatus." Metropolitan-Vickers Electrical Co., Ltd. December 29th, 1923. (226,790.)

29,257. "Connecting device for the wire of telephone or telegraph cables." A. Kvaal. December 5th, 1924. (239,409.)

30,612. "Electric heating plates." British Thomson-Houston Co., Ltd. December 20th, 1924. (226,561.)

1925.

9. "Sparking plugs." E. A. Jackson. January 1st, 1925. (239,420.)

1,730. "Electric condensers." British Thomson-Houston Co., Ltd. April 22nd, 1924. (232,920.)

2,514. "Systems of electric distribution." British Thomson-Houston Co., Ltd. January 28th, 1924. (228,551.)

4,979. "Frequency-reducing means for use with static frequency transformers." Telefunken Ges. fur Drahtlose Telegraphie. February 23rd, 1924. (229,705.)

5,288. "Rotary electric ignition commutators or distributors for internal-combustion engines." A. G. Briant. February 26th, 1925. (239,441.)

5,506. "Telephone systems." Siemens & Halske Akt. Ges. March 31st, 1924. (231,443.)

9,117. "Crystal holders of wireless receiving apparatus." J. W. Barber and Brownie Wireless Co. of Great Britain, Ltd. April 6th, 1925. (239,450.)

9,237. "Electric furnaces." Akt. Ges. Brown, Boveri et Cie. April 14th, 1924. (232,224.)

9,435. "Tiltable electric conducting liquid switch." Lurgi Apparatebau Ges. July 7th, 1924. (Addition to 230,406.) (236,518.)